

AUTOMOTIVE *and Aviation* INDUSTRIES

APRIL 1, 1947

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.... better products

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They operate with less friction, less wear, than any other type of bearing. They permit higher speeds, faster production. They hold machine parts precisely in place, under every kind of load. They assure unchanging accuracy, and uniformly better products. Write for booklet, "Why Anti-Friction Bearings."

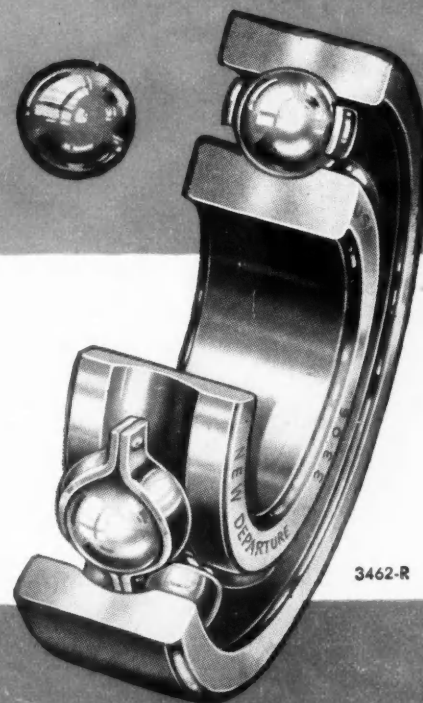
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...one grease does more jobs

HERE IS a new type of grease that offers interesting possibilities for improving lubrication on many applications in your plant.

Stanolith Greases are an outgrowth of the lithium-soap greases developed during the war to meet severe conditions in the lubrication of ordnance and aviation equipment. They are outstanding not only because of their many unusual performance characteristics but because these characteristics are combined in two grades.

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Performance Characteristics of Stanolith Greases

- operate over a wide range of temperatures—have high dropping point.
- have extreme water resistance.
- have unusual mechanical stability—a minimum of oil evaporation and separation.
- are fortified for chemical stability, contain effective inhibitors.
- are corrosion resistant.

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STANDARD OIL COMPANY (INDIANA)

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SERVICE**

AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly

April 1, 1947

Vol. 96, No. 7

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April 1, 1947

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Young-designed and Young-built radiator core for the "Farmall-H" Tractor . . . typical of the specialized service available from Young Heat Transfer Engineers.

A radiator, scientifically designed to meet specific cooling requirements, pays big dividends to the tractor manufacturer, dealer and user alike, in long, trouble-free service. A good example is International Harvester Company's "Farmall-H." This versatile tractor is cooled by a specially-engineered Young Radiator core . . . built to give year 'round service in any climate . . . to withstand steady punishment, from deep plowing to heavy harvesting. Young Engineers have made many such contributions in the Heat Transfer field.

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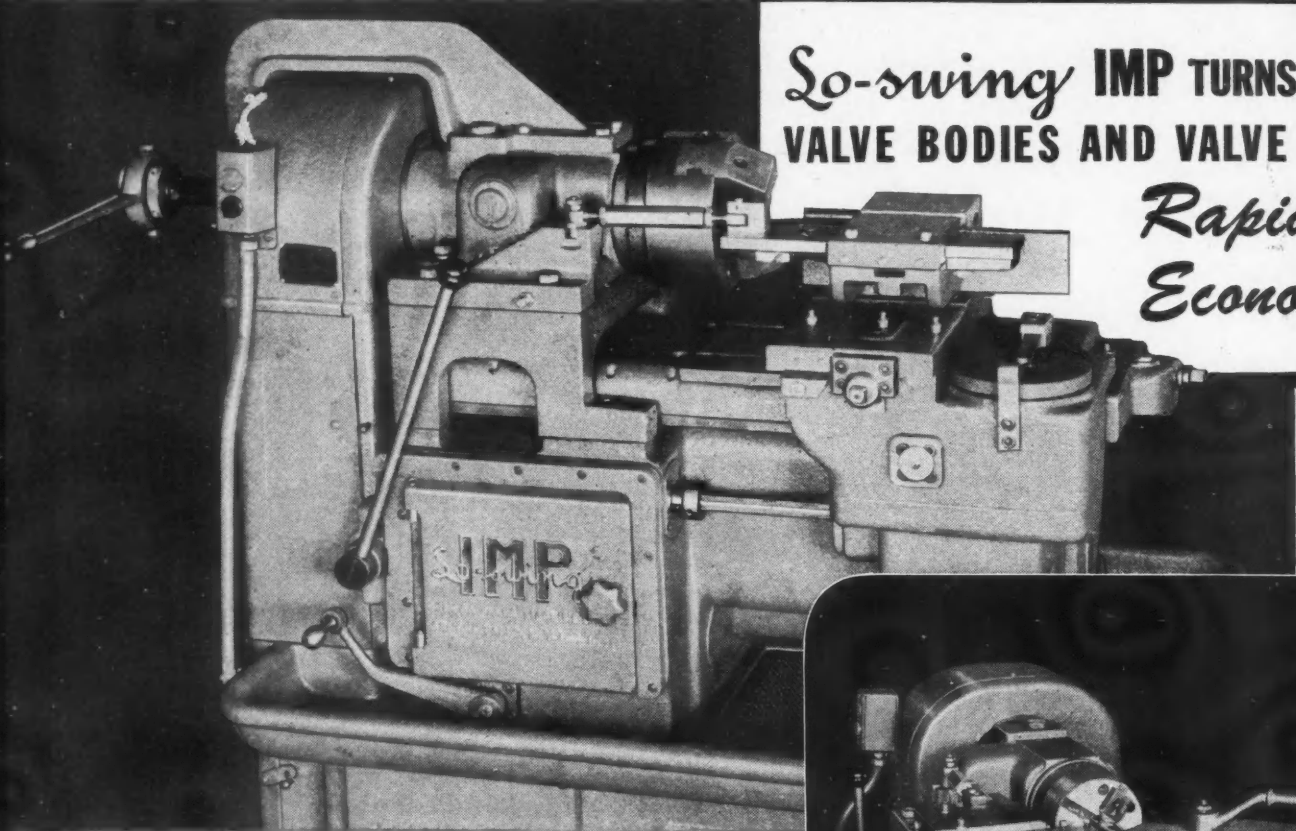
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PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



Lo-swing IMP TURNS AND FACES
VALVE BODIES AND VALVE KEYS.

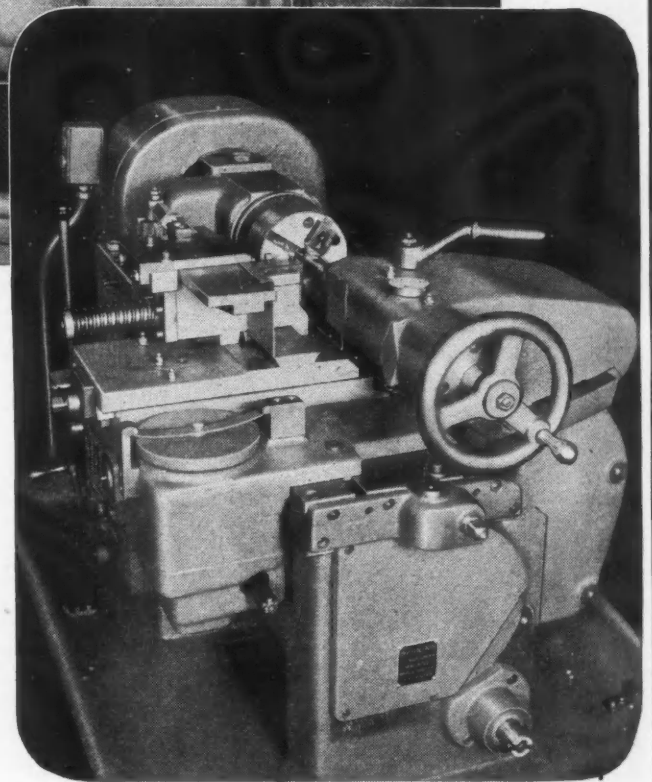
*Rapidly and
Economically*

Problem: To taper bore and back face the Valve Body and taper turn the Valve Key.

Solution: Lo-swing IMP Lathes were selected for both operations because its spindle bearings permit high spindle speeds required for turning bronze alloy and its carriage design assures unusual turning accuracy and provides protection for the ways of the bed which are completely covered at all times.

Illustration above shows the equipment for taper boring the Valve Body and facing the small end. The boring bar is controlled by an adjustable template clearly shown in the illustration. The piece is rough bored with a coarse feed on the forward stroke and finish bored with a fine feed on the return stroke. The cross slide cam automatically feeds in the tool .005" on the return stroke. The end facing operation is made with a special tool holder located in the headstock spindle bore. The operation consists of clamping the pieces in the chuck, the operator then pulls the starting lever and the facing tool lever, after which the rest of the operation is entirely automatic.

Close-up illustration at right shows the equipment for taper turning the Valve Key. The turning tool in this operation is also controlled with an adjust-



able taper template and the key is rough turned on the forward stroke and finish turned on the return stroke by the same method employed for the boring of the Valve Body. The operation consists of loading the piece between centers and pulling starting lever, the remainder of the operation is entirely automatic.

Let Seneca Falls Engineers help you solve your machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

Some High Spots of this Issue

Production "Firsts" at Plymouth's New Plant

A comprehensive study of an advanced type of plant for the mass production of passenger cars. New assembly techniques, an extensive network of conveyors and automatic spraying of sheet metal are some of the features of this postwar facility of the Plymouth Division of the Chrysler Corp. described by Joseph Geschelin beginning on page 28.

New Italian V-12 Engine

The Ferrai 125-S engine has a stroke of only 2.06 in. which permits extremely high rpm without excessive piston speed. A cutaway view shows the duplex hair-pin valve springs, overhead camshaft, double throat carburetors and other details of construction of this engine which will be used in an Italian sports car. See page 40.

A Phantom of a Ghost—Detailed Perspective Drawing of Britain's Latest Jet Engine

An excellent cutaway view makes clear such features as a single-sided impeller fed by a high-velocity intake duct, a straight-through combustion system and a single-stage axial turbine with direct ejection as employed by this de Havilland Ghost jet engine. See page 33.

Merry-Go-Round Engine Testing at Continental

A huge merry-go-round table for final inspection and tune up reduces the time for these operations at Continental Motors' Detroit plant, now operated by Kaiser-Frazer. A description of this 16-station machine that delivers a finished engine each revolution will be found on page 41.

New Mechanical Handling Speeds Truck Production

An automatic chassis roll-over conveyor, an automatically-controlled transfer station, a new wheel and tire ring rolling machine, and a front-end sheet metal assembly merry-go-round at Ford's Highland Park plant are illustrated and described. See page 38.

Torsion Bar Valve Springs in the Panhard Engine

30 Items of New Parts and New Production Equipment and Other High Spots Such As:

New Automobile Barges; Features of Packard Marine Engines; New deLackner Helicopter; and an article by W. F. Bradley on a new British tax system to increase car exports.

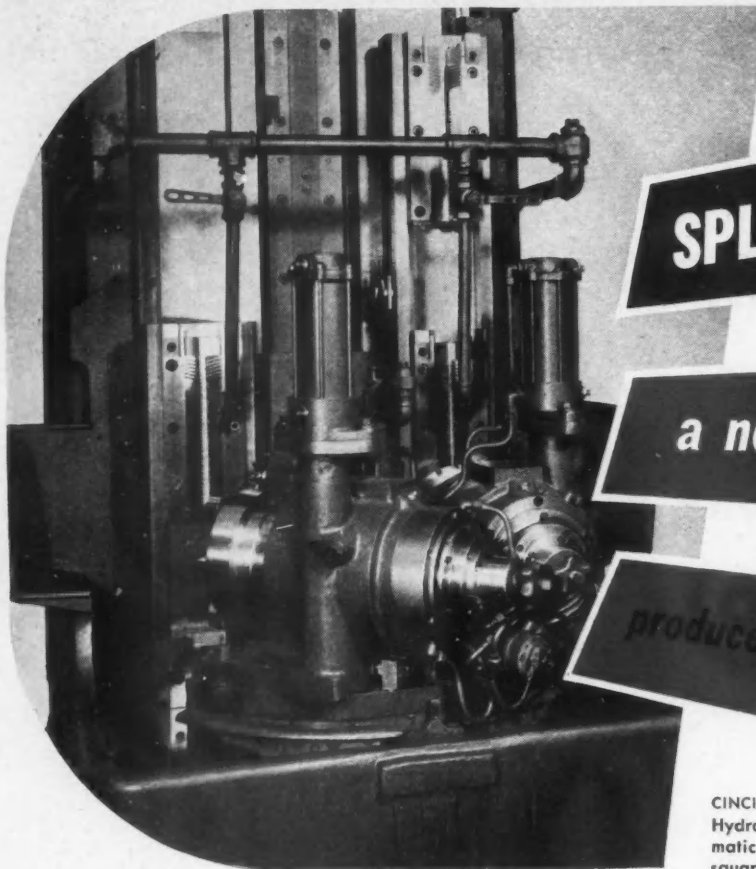
Comprehensive Interpretation of Industry News, Page 17

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AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

April 1, 1947



CINCINNATI

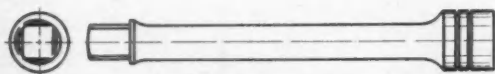
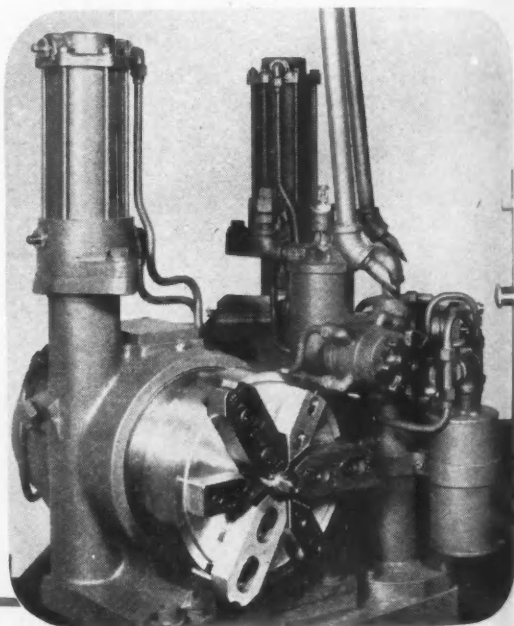
SPLIT-STROKE METHOD

a new idea in broaching

produces 578 square ends per hour

CINCINNATI No. 3-48 Duplex Vertical Hydro-Broach, showing automatic pneumatic chuck equipment and tooling for broaching the square ends of socket wrench sets. Engineering specifications on the 3-, 5- and 10-ton sizes may be obtained by writing for catalog M-1387-1.

● New production ideas and techniques are always worth investigating, for they might offer attractive cost-reduction possibilities which you could use in your own shop. In the field of surface broaching, the **SPLIT-STROKE** method is one of these new ideas. Developed by Cincinnati Engineers, it has a wide range of potential applications. ¶ Fundamentally, the **SPLIT-STROKE** method provides a noncutting gap in the broaching inserts, a brief time interval during which the work can be indexed or shifted, presenting new surfaces to the remaining cutting teeth. ¶ The example shown here is a CINCINNATI No. 3-48 Duplex Vertical Hydro-Broach, completely equipped by Cincinnati Application Engineers to broach three sizes of square ends... $\frac{1}{4}$ " , $\frac{3}{8}$ " and $\frac{1}{2}$ " ... on a family of seventeen parts. The operator loads and unloads the fixtures and the remainder of the cycle is completely automatic. ¶ The **SPLIT-STROKE** method of surface broaching is one of the many developed by Cincinnati Application Engineers to reduce the cost of machining operations. Perhaps this method could be applied to some of the parts in your shop. Our engineers will be glad to discuss it with you. Send blueprints and details.



One of the parts which was broached to a $\frac{1}{2}$ " square on the end. During an actual test run, production was 578 per hour.

Head-on view of the chuck. The three elements between the chuck jaws serve as approximate locators of the work.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES

NEWS *of the* Industry

No Export Control On Car Exports

Government restrictions on the exportation of automobiles were lifted on March 31, ending the government licensing control in effect since shortly after the war, it was announced on March 23 by the Department of Commerce. New and used cars as well as station wagons are now exempt from export control, and aluminum sheet plates and strip are also removed from export restriction. The automobile industry has exported fewer cars than permitted under the controls.

Car Prices Still a Moot Issue

Automobile prices are still a major source of interest in Detroit. Recently there have been reports that prices are likely to go up again, countered by other speculation that at least two companies are planning reductions in the coming months. Those who see higher prices point to the increasing cost of materials and the possibility of wage increases throughout the industry. They cite a statement by K. T. Keller in the Chrysler annual report that "It would be unfortunate if a further general increase in wages were to occur throughout industry, bringing in its trail a further increase in prices."

Lift Automobile Export Restrictions . . . Prices in State of Flux . . . Packard Announces a 1948 Model . . . Rumor Chevrolet Developing New Transmission . . . Kaiser-Frazer Expects Profit . . . Automobile Installment Sales Credit Up . . . Rubber Strike Wage Settlement Not to Affect Prices . . . Pig Iron Situation Brightens . . . Hope for Balanced Steel Supply . . . One Million Mark Passed.

On the other hand, observers who predict that prices will remain at present levels or even go lower later in the year say that the buyers' market is already here for some lines.

First break in the automobile price line occurred in mid-January when Ford Motor Co. voluntarily reduced prices on passenger cars. International Harvester in mid-March followed the Ford example with a price decrease, ranging from \$50 on light

trucks to \$300 on heavy models. In addition, special equipment items also were reduced at the same time. It also has been rumored in Detroit that Kaiser-Frazer is planning a price reduction and that Ford also may make a further price cut this summer. Officials of both companies have been questioned but will neither confirm nor deny the reports.

The New Packard 1948 Convertible

Supplementing Packard Motor Car Co.'s Clipper line is the new 1948 Packard Super-Eight Convertible. This new model, which is scheduled for quantity production in June, features a new 145-hp straight eight engine cradled in a specially built frame, flush contour styling, and a 120-in. wheelbase.

The engine has a bore and stroke of 3½ in. by 4¼ in., a 327 cu in. piston displacement, and seven to one compression ratio. The frame is a specially designed X-member type with box section side rails. The new car has massive bumpers, whose arms reach almost from wheel-opening to wheel-opening and are an integral part of the car. There are no rear fenders—the body sweeping over the wheels.

Other features of the Super-Eight Convertible include an instrument panel with dials illuminated by "black light." All four windows are push button controlled and individu-

The distinctive front end design and body styling of the new 1948 Packard Super-Eight Convertible are shown in this photo. Top material comes in sun tan or black. Overall length is 195.63 in. and shipping weight, 4170 lb.



NEWS of the INDUSTRY

The 1947 Frazer Manhattan



The Frazer Manhattan, 1947 model four door sedan, is the newest of the Kaiser-Frazer line. This luxury model is to be available in six interior and exterior color combinations, with the first 3000 scheduled for delivery in April at a factory list price of \$2,550.

ally operated, but the driver can operate any or all four windows from a master set. A new "Refresh-Aire System" supplies ventilation. The new car will be available in six colors.

Chevrolet Reported Working On Automatic Transmission

A report circulating in Detroit is that Chevrolet is developing an automatic transmission to be offered as optional equipment in the not too distant future. Details are scanty and without confirmation but the prospect is not considered out of the realm of possibility in view of the known intense interest in automatic transmissions by all manufacturers. The latest report is that the new unit will not be the standard Hydramatic, but will be some intermediate step.

K-F Predicts Profit at Daily Rate of 400 Cars

When Kaiser-Frazer announced its new luxury model the Frazer Manhattan, observers in Detroit frankly were puzzled about the market possibilities of the car in view of consistent reports that the regular Frazer and Kaiser Special were running into stiff resistance because of price. The Manhattan is listed at the factory at \$2550 which puts it in direct competition with Cadillac and Lincoln.

Recently, Edgar Kaiser, vice-president and general manager of K-F, reported that the initial 1947 projected output of 6000 Manhattans were contracted for and that production schedules on the model have

been advanced to 12,000 for this year. He said that the present prices are not causing cars to back up at the factory, and revealed that when K-F encountered considerable difficulty in obtaining engines, it scaled down its operations to a level of 400 a day, but even that point was too high and production was running about 325 a day in late March. However, it is believed output of engines at the Continental plant in Detroit which was recently taken over by K-F will hit 400 a day by the end of April. Kaiser indicated that the company can make money and even could cut prices to meet competition at a 400-a-day production level.

Car Time Sale Credit Increases

Another indication that the automobile market is not as lush as it was a few months ago was seen in the Federal Reserve Board report, stating that while consumer credit outstanding dropped \$174 million during January from the high point at the end of December, automobile installment sale credit rose \$37 million in January over December. Outstanding credit on automobiles was \$581 million, an increase of \$346 million over January 1946.

Rubber Wage Increase Not to Raise Prices

A rubber industry spokesman has stated that the recent 11½-cent-an-hour wage increase settlement in the threatened rubber strike will not increase the price of rubber; in fact, it is probable that rubber products prices will be reduced because of increased production.

No Pig Iron Controls—Car Industry Benefits

While the scrap iron situation still is acute, supplies apparently are on an even keel at present, although at a very low level. Some steel mills are reported to be operating with less than half the inventory usually considered a safe minimum and some are actually unloading scrap directly from cars into the furnaces.

Removal of allocations to the housing industry on March 31, with the exception of some still going to the manufacture of soil pipe, is expected to aid materially in pig iron supplies to the automotive industry. Ford is reported currently to be importing 50 per cent of its pig iron requirements from Canada, paying an import duty of 23 per cent.

Expect Sheet Steel Supply To Be In Balance by Fall

The sheet steel situation remains tight but there are signs of improvement in the coming months. It is believed that the demand from other industries such as those manufacturing stoves, washing machines, refrigerators, and similar items, will diminish somewhat within two or three months, which of course will leave more for the automotive industry. New rolling facilities are coming along slowly but are expected to be in operation this fall.

The real pinch in materials appears to be coming up from copper. Some companies are reported considering substituting aluminum parts in certain places to replace copper. It is expected that April will be the critical month so far as copper supplies are concerned.

NEWS of the INDUSTRY

Another 60 Day Deferment for Chevrolet Light Car

General Motors has extended its original stop order on machinery and equipment for the Chevrolet light car division another 60 days. It had been expected that a decision on whether or not to proceed would be made March 13 at a policy meeting, but the stop order was sent out prior to that date. Observers believe that under present conditions of short material supplies, the decision was a wise one. Die design and other preliminary work is progressing steadily and it is felt that by extending the time of starting operations, considerable economy will result. With adequate time to get ready, die layouts and specifications can be carefully checked, thus avoiding errors and revisions in specifications that often occur when a job is rushed through. In addition, GM will have a chance to obtain much better correlation of machinery and equipment and can do a much better overall planning job. So far as the Chevrolet light car itself is concerned, latest unofficial information is that the car is pretty much a smaller version of the present Chevrolet with an overall size of 75 to 80 per cent of the current model. The engine is said to be a small six-

cylinder unit with great operating economy; wheels are smaller, and have only four bolt holes at the hub rather than five as in the present model. Our informant guessed that the weight of the vehicle in its present design would be under 2500 lbs. It should be remembered that this is strictly gossip information and might be entirely out of line with what ultimately appears.

Du Pont Builds in Toledo

Construction of the Du Pont Co.'s new chemical specialties plant at Toledo, O., will start at once. Following its completion, production and distribution of the chemical specialties line of automotive and home products will be centralized in Toledo.

Industry Passes Million Mark Three Months Ahead of 1946

Production of passengers cars and trucks passed the one million mark the week of March 22, fully three months ahead of the same production total last year.

Production for the first quarter of this year according to manufacturers was only a little below one fourth of 1941 output. If strikes and serious materials bottlenecks do not de-

velop, the industry stands a good chance of equaling the 1941 production figure. Current thinking now is that if strikes in the automotive or basic supply industries do come, they will crop out in May and June. However, the thinking still is that major strikes will be avoided.

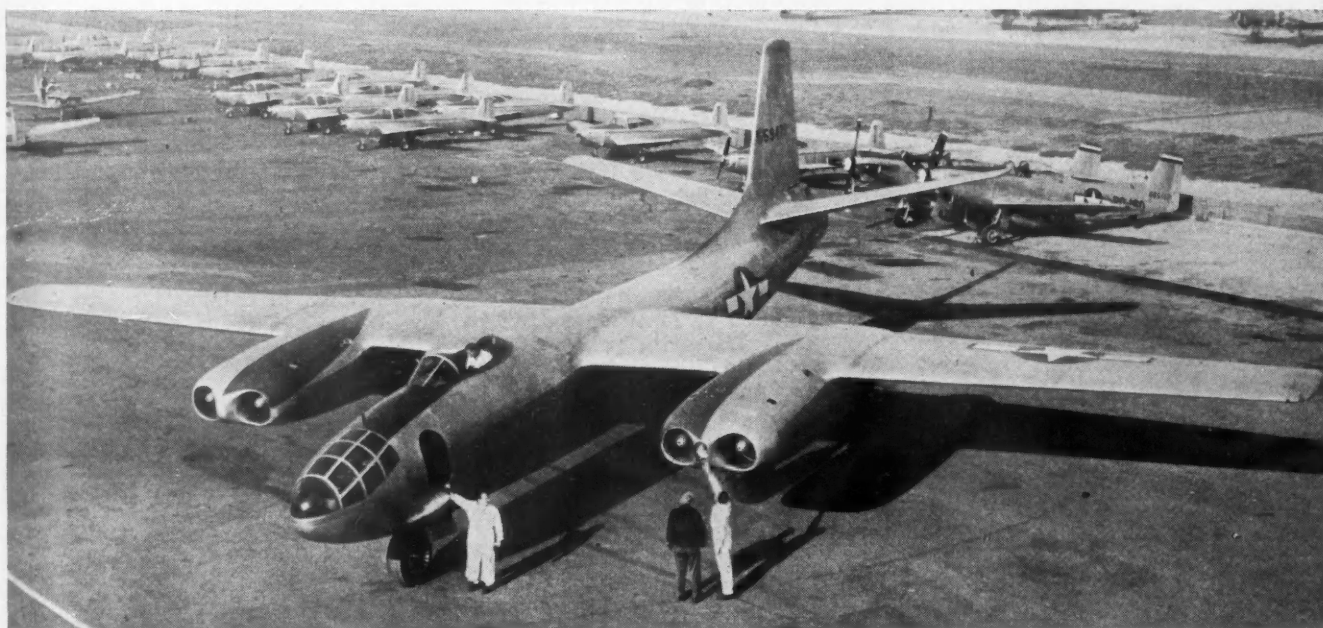
New Weekly Production High

A preliminary figure of 107,230 indicates that weekly production of cars and trucks produced in the United States and Canada reached a new postwar high for the week ended March 22.

Production of Cars and Trucks in U. S. and Canada

Week-ending		1947	Corresponding Week in 1941
Jan.	4.....	53,437	76,690
	11.....	64,828	115,935
	18.....	75,166	124,025
	25.....	93,278	121,948
Feb.	1.....	94,114	124,400
	8.....	89,958	127,675
	15.....	97,276	127,510
	22.....	103,400	127,740
Mar.	1.....	105,175	126,550
	8.....	104,048	125,915
	15.....	105,496	131,410
	22.....	107,230	123,805
Total.....		1,093,406	1,453,603

America's First Four Jet Bomber, the XB-45



One of America's first operational bombers to employ jet propulsion, the Army Air Forces' experimental bomber, the North American XB-45, powered by four jet engines recently completed successfully its first test flight at Muroc Army Air Base, Calif. Trav-

eling at a speed described by the AAF as "exceedingly high," the new bomber's four jet engines are arranged in pairs in single nacelles in each wing. It has a wing span of 89½ ft, is 74 ft long and 25 ft high from ground to tail top

NEWS of the INDUSTRY

Dream Cars Nightmares to Automobile Makers

One bane of the automotive manufacturer is the constant "sounding off" by false prophets who predict startling innovations in automotive design. H. C. Doss, general sales manager of Nash, recently expressed the views of the industry by declaring that "rumors of revolutionary changes in coming automobiles fall into the class of day-dreaming. Since the early days of the automobile, the industry has learned to make changes with all the deliberation of Swiss mountain climbers. Manufacturers who rushed engineering and design changes without careful experimenting were penalized when the public refused to buy. While car owners can expect continued steady advancement in coming cars, seven-cylinder radial engines, supersonic horns, atomic power and cars with detachable wings and bathtubs are still a long way off."

High Octane Fuels May Shorten Engines

Published report that Buick is experimenting with a V-8 engine must be considered in the light of known automotive engineering practice. All

Jan. Production Down 63% from Dec. Motor-Vehicle Factory Sales from U. S. Plants

	Passenger Cars	Trucks	Buses	Total
October	283,526	107,166	975	391,727
November	269,081	100,929	1,146	371,156
December	266,665	107,616	1,438	375,719
Total, 1946	2,148,677	930,739	10,091	3,089,507
January, 1947	56,367	45,033	467	101,867

Factory Sales to Domestic and Foreign Markets

	PASSENGER CARS	
	Domestic	Foreign
October	263,236	20,350
November	250,379	18,702
December	244,931	21,734
Total, 1946	2,004,616	144,081
January, 1947	53,441	2,926
	TRUCKS	
	Domestic	Foreign
October	88,207	18,959
November	79,138	21,791
December	82,774	24,842
Total, 1946	744,610	186,129
January, 1947	37,970	7,063
	BUSES	
	Domestic	Foreign
October	923	52
November	1,102	44
December	1,339	99
Total, 1946	9,277	814
January, 1947	436	31

Jap Glamourized Jeep



In Tokyo, jeeps are being glamourized. This jeep is dressed up in a sedan body, but buyers in Japan may convert their jeeps into anything from a limousine to a station wagon, thus combining attractive body styles with jeep utility. However, the price is high, particularly if luxury upholstery is desired.

International News Photo

companies, of course, are continually working with various types of engines with a view to possible use at some later date. Apparently that is the case with the Buick V-8. Buick, like all other manufacturers, recognizes that considerable advancement is being made in developing improved high octane fuels and that their use involves higher compression and greater strain on crankshafts and bearings. As a result, the long crankshafts currently being used in straight 8 engines are not as suitable as short ones, and ultimately some means of shortening the crankshaft assembly will have to be found. The general belief is that the V-8 engine is the answer, but some individuals still think that the in-line engine could be shortened up enough to meet the high octane requirements.

More Delay at Flint for Chevrolet

Starting date of operations at the new Chevrolet assembly plant at Flint again has been delayed, this time to late May or early June. Previously, the project had been deferred several times because of construction delays. Originally the plant was scheduled to start operating in July 1946. The principal bottleneck now is the inability of the Fisher Body unit, which is being built in conjunction with the plant, to get delivery on electrical equipment—chiefly welders. When completed, the plant will have a capacity of 60 passenger cars and 20 trucks an hour.

Goodrich Opens Troy, O., Plane Wheel and Brake Plant

A new plant housing the airplane wheel and brake div. of The B. F. Goodrich Co. has been opened at Troy, O. It will make brakes and wheels for all sizes and types of

planes—ranging from the 5 lb unit for a oneseater to the 334 lb wheel-and-brake used on the Army's new B-50. Equipment has been moved from the Jackson, Mich., plant of Hayes Industries, Inc., whose airplane wheel and brake div. was purchased by B. F. Goodrich in 1946. Additional new facilities have been installed in the building, which was an aircraft plant, operated by Waco, during the war.

Carnegie and Inland Exchange Rights

Carnegie-Illinois Steel Corp., United States Steel subsidiary, announced recently that Inland Steel Co. has been licensed to manufacture "Cor-Ten," the well-known corrosion-resistant, high-strength, low-alloy steel developed by Carnegie-Illinois. Inland Steel, in turn, has licensed Carnegie-Illinois to manufacture "Hi-Steel," likewise a prominent corrosion-resistant, high-strength, low-alloy steel developed by Inland.

Of the new post-war railroad passenger cars, 70 percent incorporate substantial amounts of "Cor-Ten." The number of railroad freight cars now in active service constructed in whole or in part of "Cor-Ten" exceeds 90,000, in addition to thousands of trucks, buses, trailers, street cars, mine cars, and other vehicles. "Hi-Steel" is a low alloy structural steel which is being used extensively by railroads because it permits lighter weight construction without sacrifice of strength or safety, and is coming into broad use in the automobile industry for stress parts. It also is being used in bull dozers, structural framework, ships, trailers, and other products demanding light weight, high strength, and great resistance to impact, fatigue, abrasion, and corrosion.

NEWS of the INDUSTRY

Interest Grows In Bonded Brake Linings

Automotive manufacturers are said to be experimenting with bonded brake linings with one or two reported to be thinking seriously of using it on 1948 models. All companies indicate that this type of lining, which is bonded to the shoe with a thermosetting plastic instead of the conventional rivets, offers worthwhile advantages and inevitably will come into general use. Dodge Truck has been using bonded linings on its light trucks for many months and reports considerable success. However, some other manufacturers feel that more work will be necessary before they are ready to adopt it.

Helicopter Forum And Air Show Held

The Third Annual Forum of the American Helicopter Society was held in Philadelphia March 27 to 29. Two days of technical sessions covering all phases of the development of rotary wing aircraft were followed by an exhibit of the largest collection of helicopters, autogiros and other types of rotary wing aircraft and the first regularly scheduled helicopter air show at Camden, N. J., on March 29.

The constantly expanding body of rotary wing aircraft pilots have formed a group known as the "Twirly Birds" which parallels the pioneer fixed wing aircraft pilot organization, the "Early Birds." The "Twirly Birds" held their annual organization meeting in Philadelphia on March 28.

Plastics for Car Windows

A proposed revision by the Society of Automotive Engineers to the American Standard for safety glass would include requirements for plastics for use in windows of motor vehicles, although not in windshields.

New British Austins for Export

Austin took advantage of the Geneva automobile show to uncover a new model which obviously has been put in production exclusively for the export market. The new model has a six-cylinder $3\frac{1}{2}$ litre overhead valve engine, with a bore and stroke of 3.35 by 4.0 in. and a compression ratio of 6.8 to 1 in a chassis of 119 in. There are two variations, known as the "110" and the "120," these representing the maximum brake hp.

The "110" has a single Stromberg down-draft carburetor, while the other model has twin Strombergs. Other chassis details are similar. A cast-iron head is used; pistons are aluminum-alloy split skirt type with an anodized surface and the oiling system incorporates jet lubrication of the cylinder walls.

Following classical design, Austin has adopted independent front suspension for the first type, this being by helical coil springs with wishbones and double-acting hydraulic shock absorbers. The transmission provides four speeds and reverse, with synchromesh on second, third and fourth. Rear suspension is by semi-elliptics. Brakes are hydraulic front and rear, and steering gear is Bishop cam and lever. A built-in powered jacking system is incorporated, this being operated by an electric motor driving an hydraulic pump and lifting all four wheels simultaneously. The gear shift lever has been mounted on the steering column, and the hand brake is trigger type control under the instrument panel.

The main differences between the "110" and the "120" are in body styling. The former, which adheres to classical English lines, is a four door sedan of composite steel and light-alloy construction, with a sliding roof, a bench type adjustable front seat, very narrow running boards and front fender fairings dying out at the extremity of the rear door. In the frontal appearance there is no breakaway from previous designs.

The second, or Van den Plas model,

has more distinctive lines, with headlights set in the front fender, the fairings of which die out in the forward door. Other body features are the abolition of running boards, and the enclosing of the rear wheels. The Van den Plas model is upholstered in cloth, with leather edges to the seats. Prices announced in England are £1,000 and £1,500 for the respective models, without purchase tax.

A 2800 lb delivery truck with side entrance and a body capacity of 300 cu ft is also announced, as well as an ambulance on the same chassis and a station wagon on the 16 hp chassis. This latter has a body in ash framing with wood panels and a fabric top.

Stratofreighter Passes Test

The Army Air Forces YC-97 Stratofreighter, built by the Boeing Aircraft Co., successfully completed its first test flight recently at Boeing Field, Seattle. A long-range troop and cargo transport, the YC-97 stayed aloft for 37 minutes on its maiden flight. The Stratofreighter, cargo version of Boeing's famed B-29, spans 141 ft 2 in. across the wing and is 110 ft 3 in. long. It is capable of attaining a maximum speed in excess of 300 mph and can carry its cargo load approximately 4,000 miles. It carries a crew of five and operates at a service ceiling of 30,000 ft.

For Business and Pleasure, Waco's Aristo-Craft



Its preliminary test flights completed, the Waco Aircraft Co.'s Aristo-Craft will soon go into production. Said to be the first four-place, two-control airplane for the private market, the Aristo-Craft is powered with a 215 hp Franklin air-cooled engine, it has an estimated range of 606 mi at a cruising speed of 135 mph at sea level.

NEWS of the INDUSTRY

Allison Now Makes All J-33 Jets

Complete responsibility for the Army Air Forces' J-33 (I-40) jet engine, originally designed and developed by the General Electric Co., now is centered at the Allison Division of General Motors, Indianapolis, where facilities for mass production are available. The J-35 or TG-180 axial-flow gas turbine, which powers the Republic P-84 "Thunderjet" is also produced principally at Allison. The torpedo-shaped J-35 recently was manufactured under AAF contract at the Chevrolet Div. of General Motors. G. E. retains engineering and design responsibility for the J-35 gas turbine, and will continue to supply the AAF, with a number of the engines for its new jet-propelled bombers and fighters, as well as design and develop newer, more powerful gas turbines in cooperation with AAF engineers.

A New Wrinkle In Time Buying

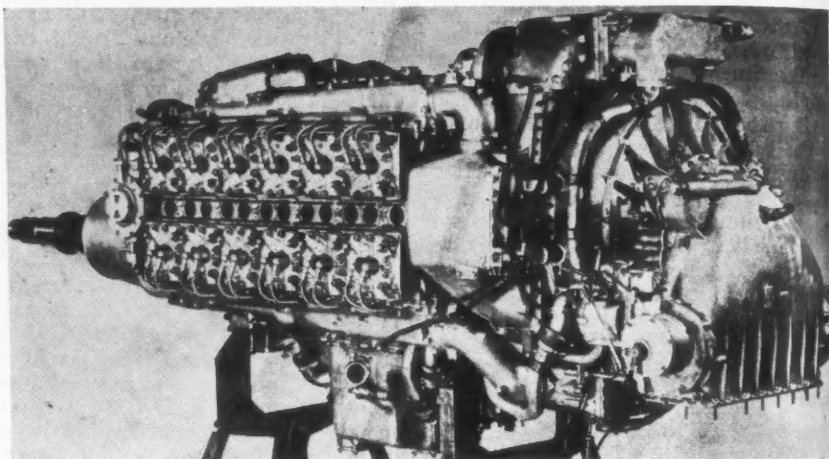
The Security-First National Bank of Los Angeles has developed a streamlined credit plan for automobile buyers which gets to the potential automobile purchaser before the finance company. The credit in advance principle is employed in this new plan which operates with the cooperation of insurance brokers. The bank supplies the brokers with credit applications which are circulated among the latter's clients. The bank then issues an automobile-purchase card which is good for six months—if the prospect is a good credit risk. The card is then equivalent to cash at any of the bank's 124 branches in California, and the car buyer may sign a purchase contract which the bank will honor within 24 hours or he may write a check payable to the dealer for the full price;

Possible Subject of Congressional Investigation



Howard Hughes' huge \$18 million flying boat is shown here with engines and propellers in place. In a voluntary appearance before the Senate War Investigating Committee, Hughes predicted that the flying boat would fly this year, and that all terms of the Government contract would be met. *International News Photo*

Britain's Biggest Piston-Type Engine



The Rolls-Royce 3500 hp "Eagle," is a liquid-cooled "H" type engine with four rows of six cylinders in line, and sleeve valves. The "Eagle" has undergone tests in a secret airplane produced by the Westland Aircraft Co. *British Combine photo.*

in either case, the dealer gets cash, and cooperating broker the insurance contract.

Indian Motorcycle Acquires Hill Diesel

As part of the overall consolidation of the corporate structure of R. B. Rogers, Inc., control of the Hill Diesel Engine Co., Lansing, Mich., has been acquired by the Indian Motorcycle Co., Springfield, Mass.

New Officers Of Sun Oil Co.

Joseph N. Pew, Jr., executive vice-president, and Robert G. Dunlop, comptroller, have been elected chairman of the board, a new position, and

president of the Sun Oil Co. Mr. Dunlop succeeds J. Howard Pew who continues as a member of the board of directors. Clarence H. Thayer, chief engineer, is now a vice-president, and Donald P. Jones, assistant comptroller; Arthur E. Pew, Jr., has resigned as vice-president in charge of manufacturing, but will continue as a member of the board of directors.

Total Dividends Up in '46—Car Dividends Down

1946 was a good over-all year dividendwise but not for the automobile industry. A compilation by the Department of Commerce of all publicly reported cash dividends, which account for about 60 per cent of all dividends, shows that 4.33 billion dollars were paid in dividends in 1946 as against 3.88 billion in 1945, a gain of 12 per cent. However, the automobile industry paid 167 million dollars in 1946 as against 203 million in 1945, a decrease of 18 per cent.

British Motorcycles Rolling In

Great Britain is cutting a wide swath in the domestic motorcycle market. Only 378 motorcycles were shipped by the British into the United States in 1940, while in 1946, 9400 worth \$2,206,729 were shipped, equal to approximately one-third of U. S. production.

NEWS of the INDUSTRY

LABOR

Union Serves Demands on General Motors

The UAW formally served notice of its wage demands on General Motors on March 21. The union demands are a wage increase of 23½ cents an hour, a guaranteed weekly wage equivalent to 40 hours' pay for any week in which an employee gets called to work, group insurance and retirement programs to be financed by the company, and a change in methods of computing vacation pay.

The demand for a guaranteed work week is a new approach to the guaranteed annual wage. In essence the plan calls for a full 40 hours pay for any week in which workers are called into the plant regardless of whether or not they have worked the full 40 hours. There has been no official comment from GM on this point, but C. E. Wilson, president, said in an interview that if materials are available there will be no need for a guaranteed work week.

Ford Workers Ask Union To Seek Discounts on Cars

Apparently the recent flare-up over granting discounts to production workers on purchase of new automobiles has died down but is not a dead issue by any means. One unit of Ford Local 600 lists a demand for cars at discount to all Ford workers as an important point to be brought up when a new contract is negotiated.

Strike Voted at Nash-Kelvinator

Members of Local 75 of the UAW-CIO are said to have voted more than 10 to 1 in favor of a strike at the Seaman Body Division of the Nash-Kelvinator Corp. According to the president of Local 75, a "down payment" on the 23½-cents-an-hour national pattern set by the International UAW for the car industry would be demanded.

Foremen Speed Unionization

Immediate result of the Supreme Court decision legalizing organization and collective bargaining of supervisory personnel has been a revitalized drive for membership by the Foremen's Association of America. The president of FAA

states that there are about two million prospective members in American industries and the union now is going to push its organizing efforts. The question is not finally settled, however, since there are several bills before Congress to ban unionization of supervisory employees. Incidentally, the FAA has organized a powerful lobby in Washington to battle the pending legislation. Reaction in Detroit to the high court ruling was calm since no definite action can be taken until the outcome of Congressional legislation is known. Packard, of course, will proceed with negotiations with the FAA. There have been some suggestions previously that foremen might have to be relegated to positions of job leaders, but since that was not necessary at Ford and Kaiser-Frazer Corp. where foremen have been organized for a couple of years, the industry might find that unionization of supervisory personnel would not prove to be an impossible situation.

Unions Base Wage Boosts on Magic Arithmetic

On the question of wage increases, it certainly is definite that the recent upturn in food and other prices will strengthen the hand of labor, but the general belief still is that wage boosts are likely to be in the 10 to

15 cents an hour range as predicted several weeks ago.

Another complicating factor is that financial reports currently appearing show automobile companies to be earning satisfactory profits since the beginning of the last quarter of 1946. Already the union has seized on the Chrysler annual report, with leaders stating that an analysis reveals operating profits after taxes were greater than quarterly averages in the most profitable years in Chrysler history and that as a result wages can be increased without the need for a boost in automobile prices. While the analysis is substantially correct as far as it goes, the union has failed to take into account that heavy operating losses were incurred during the first nine months of operation so that the overall profit for the year amounted to \$18,889,289 which was increased to \$26,889,289 after recovery of excise profit taxes. The net profit represents 3 per cent of sales after recovery of taxes. Net profit for the years 1941, 1940, and 1939 were \$40,140,420, \$37,802,279, and \$36,879,829 respectively. Nevertheless the excellent showing in the last quarter of last year is being capitalized to the fullest by the union in its wage drive and undoubtedly the same will be true of other automobile companies.

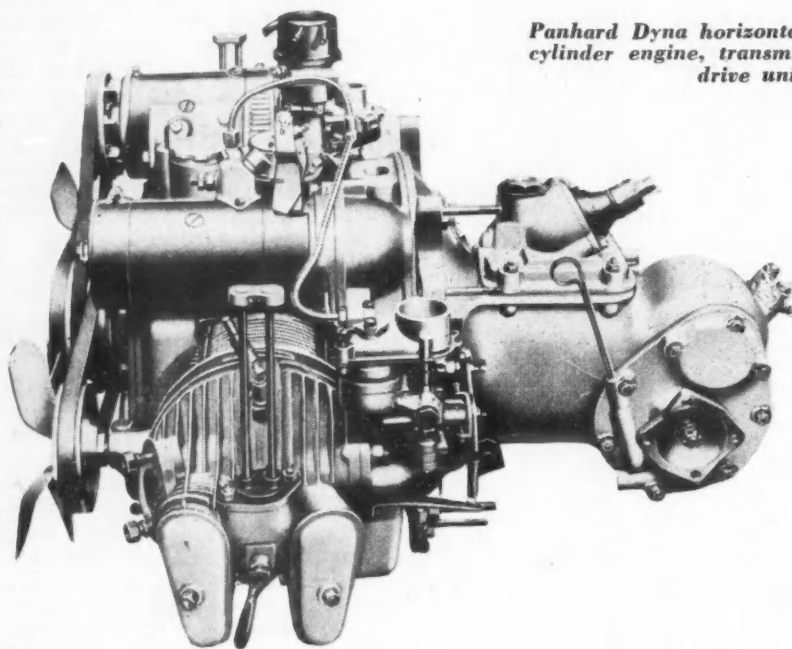
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From Gas Tank to Automobile Body

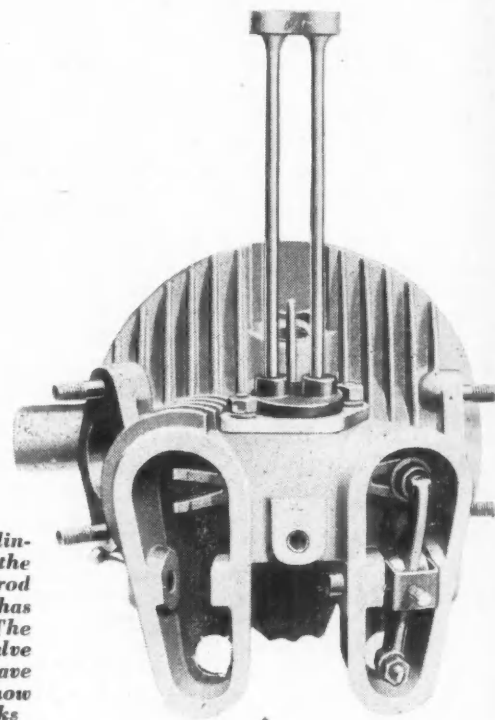


Starting as an auxiliary gasoline tank of an Army bomber, this "Scoot-Mobile" turned out to be an automobile claimed to be capable of 75 miles on a gallon of gasoline at 40 mph on its three airplane wheels. Among its mechanical highlights are automatic shift, knee action, and three wheel brakes. It is expected that it will market for \$350. Associated Press photo.

Torsion-Bar Valve-Springs of **Unusual** *Design*



Panhard Dyna horizontally opposed two cylinder engine, transmission and front drive unit



This view of the cylinder head shows how the Panhard torsion-rod valve spring system has been installed in it. The two covers and a valve and rocker arm have been removed to show the torsion-bar forks

FEATURED on the new French-designed lightweight Panhard Dyna car is an unusual torsion-bar valve-spring system which is claimed to give better valve seating and quicker valve action at high engine speeds, thus eliminating floating valves as an engine speed limiting factor. Patented feature of the torsion-bar valve-spring system is the use of torsion bars in pairs, thus reducing the length of the installation and eliminating the problem of housing longer bars. The valves are mounted vertically in the cylinder head, and are operated in the usual manner by push-rods and rockers. This system is shown in the accompanying illustrations. Metal used for the bars is chrome-nickel steel. The manufacturer states that 500 hr of bench tests and 60,000 miles of road tests have been carried out with the system.

The Panhard Dyna is powered with an horizontally-opposed, two-cylinder, overhead valve, air-cooled engine of 36 cu in. displacement, 2.83 in. bore and 2.95 in. stroke, developing 25 hp at 4000 rpm. Each cylinder is a light-alloy casting with a fixed head and removable liner. It is claimed that with this one-piece construction, together with the torsion-bar valve-spring

arrangement, the valves rarely require attention. The cylinders are offset 1.574 in. to allow side by side mounting of the connecting rods, which have roller bearings. The crankshaft is also carried on two roller bearings. Starting motor, generator, distributor and gasoline pump are mounted on the top of the aluminum crankcase. Each cylinder has its own carburetor; and there is a fan per cylinder, driven by belt from the crankshaft. A third belt drives the generator.

Total weight of the car is 1046 lb, empty. It has a front-wheel drive with the usual arrangement of engine, clutch, transmission and final drive through transverse half-shafts. The transmission provides three forward and one reverse speeds.

It is interesting to note that Panhard has dropped the use of light alloys for the chassis. The entire frame is constructed of steel, and comprises two welded box-section side rails, with a longitudinal rib serving

Used in French Engine

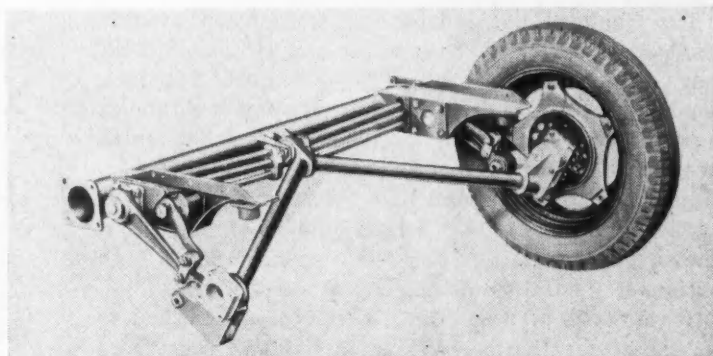
New Panhard 1000-Lb. Car Also Equipped with Front Drive, Independently Sprung Wheels, and Torsion Bar Suspension and V-Shaped Axle at Rear

to locate a thick rubber pad on which the body rests. At the rear the side rails are united by a big diameter tube, bolted in position and carrying the rear suspension and the wheel mechanism. At the front there is a pressed-steel platform flanged and bolted to the side rails, to which the power plant is attached at four points on heavy rubber blocks. The two transverse springs are attached to the steel platform, while the rack and pinion steering gear is mounted on the power

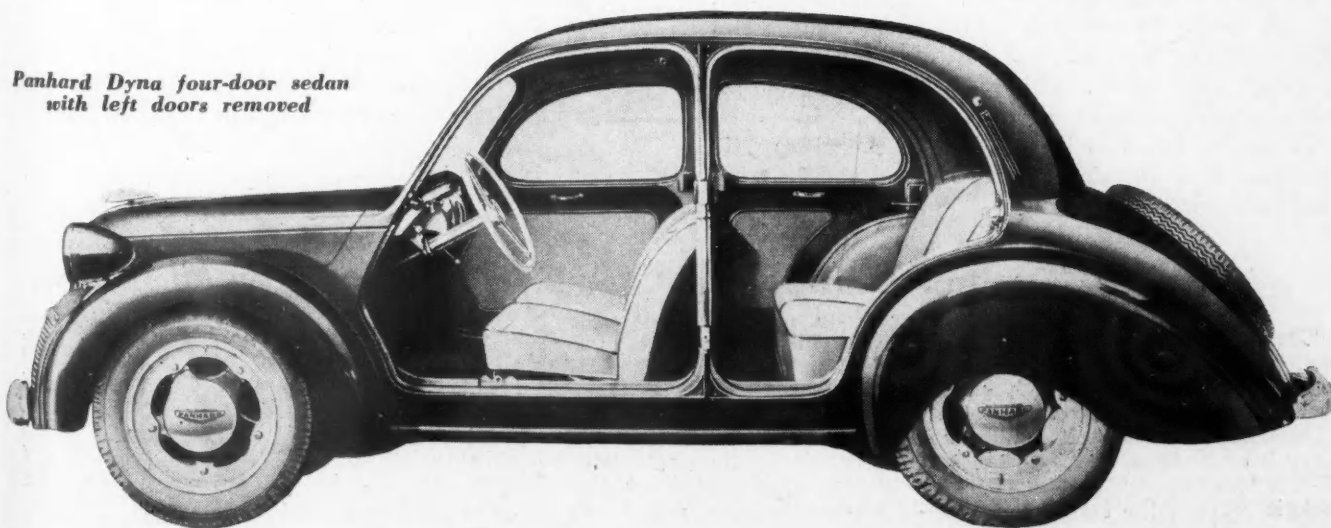
By W. F. Bradley

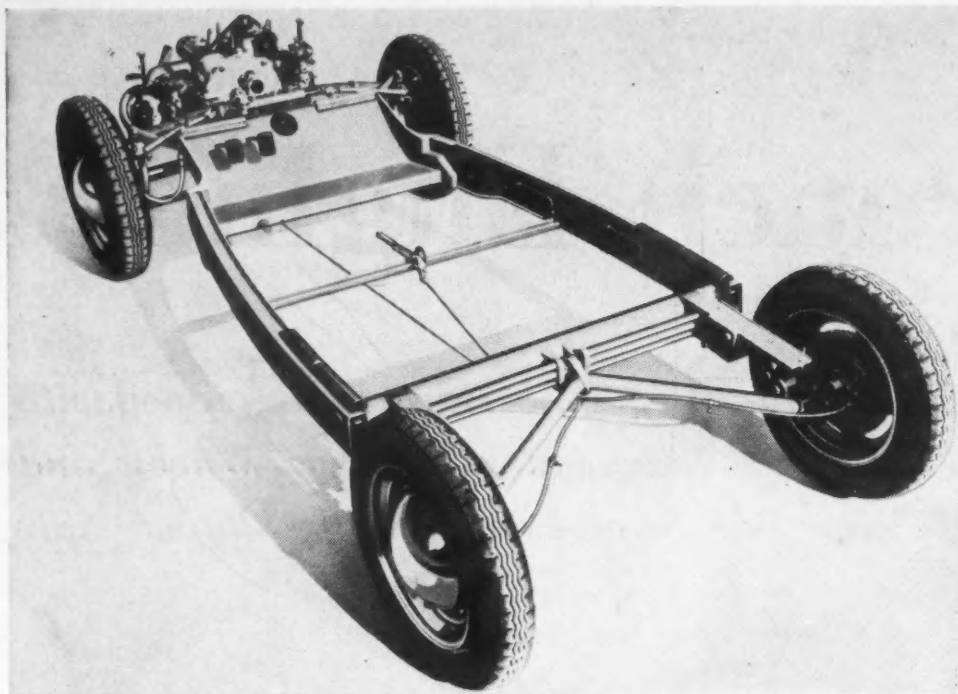
European Correspondent of
AUTOMOTIVE and AVIATION INDUSTRIES

Torsion bars provide springing action in the independent rear-suspension of the Panhard. Three steel bars are employed for each wheel, being joined at one end to a radius arm connected to the wheel mounting, and at the other end to the tubular rear crossmember of the frame. Unusual feature of this rear suspension is the V-shaped axle which is joined at the apex to the rear crossmember



**Panhard Dyna four-door sedan
with left doors removed**





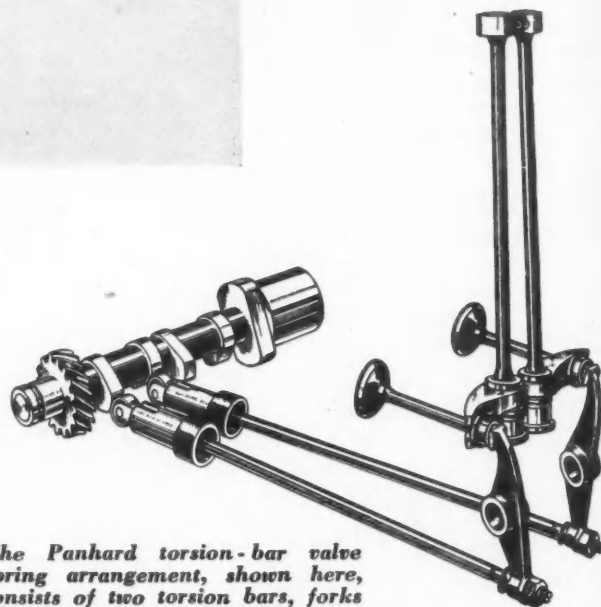
Shown here is the chassis construction of the Panhard Dyna. Note the thick rubber sections mounted on the side rails

plant. It is claimed that this steel construction gives practically the same weight as light alloy frame, while being a cheaper and more satisfactory manufacturing proposition.

The Panhard has independent suspension at both front and rear, with transverse torsion bars at the rear. The rear design, which is the subject of patents, consists of a V-axle articulated at its apex to a tubular cross member of the chassis. The wheels are mounted on the two extremities of the axle, which is linked by radius rods to the torsion bars. The torsion bars are supplemented by Houdaille hydraulic shock absorbers. The advantages claimed for this suspension are a high degree of flexibility in a vertical direction, and an entire absence of roll. Each wheel being attached to the chassis by the axle V, radius rod and rear cross frame member, it cannot move laterally in relation to the body. The result is equivalent to that which would be obtained if it were possible to mount semi-elliptic springs to the chassis on the outside of the wheels.

Brakes are Lockheed type in front and mechanical at the rear. Wheels are of the detachable rim type with five lugs, and are bolted to the five arms of a light alloy spider. This reduces unsprung weight and also the weight of the spare wheel.

The body, which is independent of the chassis, is constructed of Duralniox members and sheet aluminum panels, with thick rubber strip between the frame



The Panhard torsion-bar valve spring arrangement, shown here, consists of two torsion bars, forks carrying the valve stems, and the usual push-rod and rocker-arm system operating from the camshaft. The torsion rods are fixed at their upper ends, and the lower end of each is joined to a fork

members and the panels. A rear compartment, accessible from the inside, provides baggage space.

Overall car dimensions are 141 in. by 56.6 in., with a wheelbase of 80 in. and a tread of 48 in. Maximum speed, according to the manufacturer, is 62 mph; and the gasoline consumption is stated as 39 miles per gal. This car is expected to be in production by the coming summer.

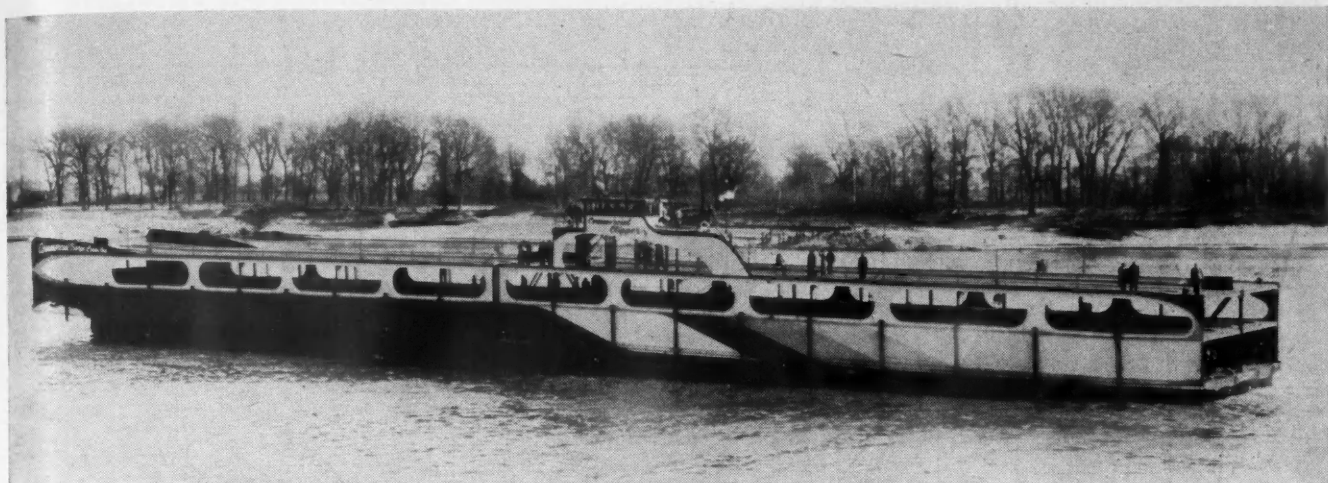
New Trainer Plane with "Push Button" Controls

"Push button" Flight training to facilitate instrument flying instruction was revealed when North American Aviation, Inc. announced the development of an experimental U. S. Navy intermediate trainer, the XSN 2J-1. A set of controls in the rear cockpit permits the instructor to up-

set temporarily certain controls in the cadet's front cockpit, simulating emergencies as a training aid.

The XSN2J-1, a low wing, all-metal two-place airplane is powered by a nine cylinder 1100 hp Wright engine equipped with a single stage, two-speed supercharger, and a three-

bladed Hamilton Standard Hydro-matic propeller. It has a top speed of 270 mph and a service ceiling of 30,000 ft. Standing 14 ft seven in. high, the XSN2J-1 has a wing span of 42 ft. 11 1/4 in., and a length of 33 ft. 10 in. Its normal gross weight is approximately 8500 lb.



The "Commercial Clipper," one of the Diesel-powered barges for transporting automobiles, is shown here operating with two of its three units during trial runs on the Mississippi. When completed, the addition of another unit will permit this new carrier to move a full load of 600 cars at an average speed of 14 mph

New Automobile Barges

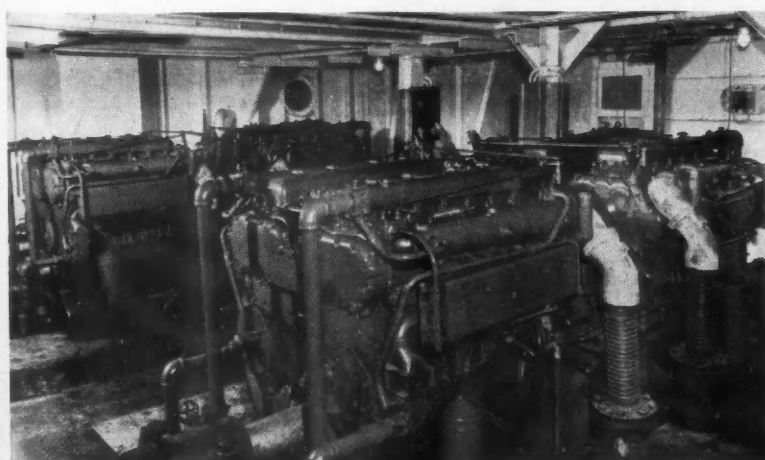
Incorporate Special Propulsion and Loading Features

Two 525-foot all-steel automobile-carrying barges, built by the St. Louis Shipbuilding and Steel Co., incorporate new commercial adaptations of wartime developed propulsion principles and loading techniques which are said to give these river vessels three times the carrying capacity and speed of former equipment. The new features include a 2000 hp multiple Diesel engine unit which can drive the vessel at a speed of more than 14 mph, a controllable pitch propeller, and a separate floating deck barge that permits simultaneous loading of all four decks of the carrier. These river vessels will be operated by the Commercial Barge Lines, Inc., Detroit, for transporting new cars and trucks from Cincinnati, Chicago, and Evansville, Ind., to terminal points on the Tennessee or Mississippi

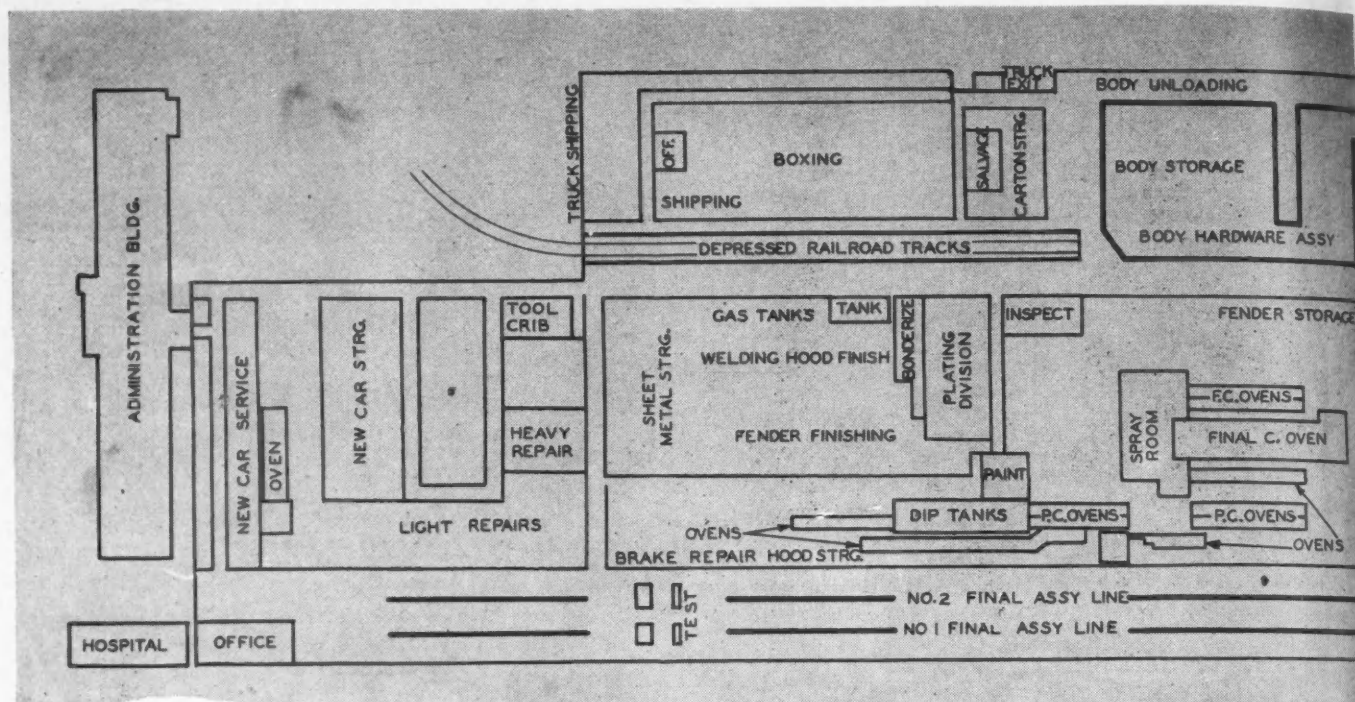
rivers. A proposed route from Kansas City, where a General Motors B-O-P assembly plant is located, down the Missouri and Mississippi rivers is contemplated.

Each of the 525-foot barges consists of three separate 175-ft units tightly joined by cable and ratchets. The bow and center units are made up of four cargo carrying levels, all of which may be loaded or unloaded from either end by the use of adjustable ramps. The stern section is the power unit, with an elevated pilot house located on the port side. Crew accommodations, propulsion engines, maintenance machinery, and fuel bunkers are all located in the hull of this unit. In addition, three levels of storage area are available for cargo. In operation, the vessels may be made up of either two or three units, depending upon load requirements. Three integrated units can accommodate 600 automobiles and 498

(Turn to page 88, please)



This view of the engine room of the "Commercial Clipper" shows two of the three GM Diesel Quad propulsion units. Each Quad unit consists of four basic six-cylinder engines mounted together and driving a single propeller shaft



Production

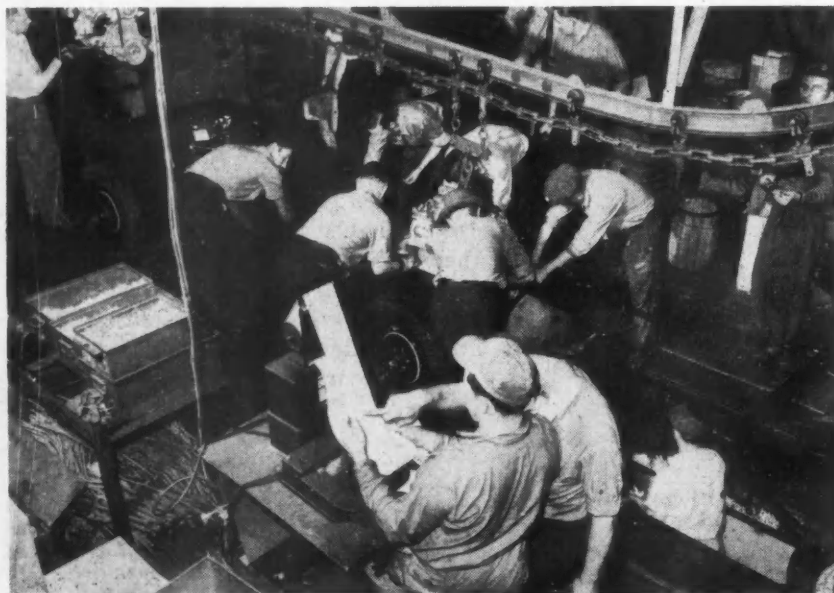
By Joseph Geschelin

ALWAYS an exponent of motor car manufacturing under one roof in a single-story building, the Plymouth Division, Chrysler Corp., represents a complete metamorphosis for its postwar operations. During the war Plymouth was forced to clear the entire facility and turn it into an arsenal, so in the reverse process—reconversion to passenger car production—the management grasped the opportunity to create a plant of the most advanced type by taking

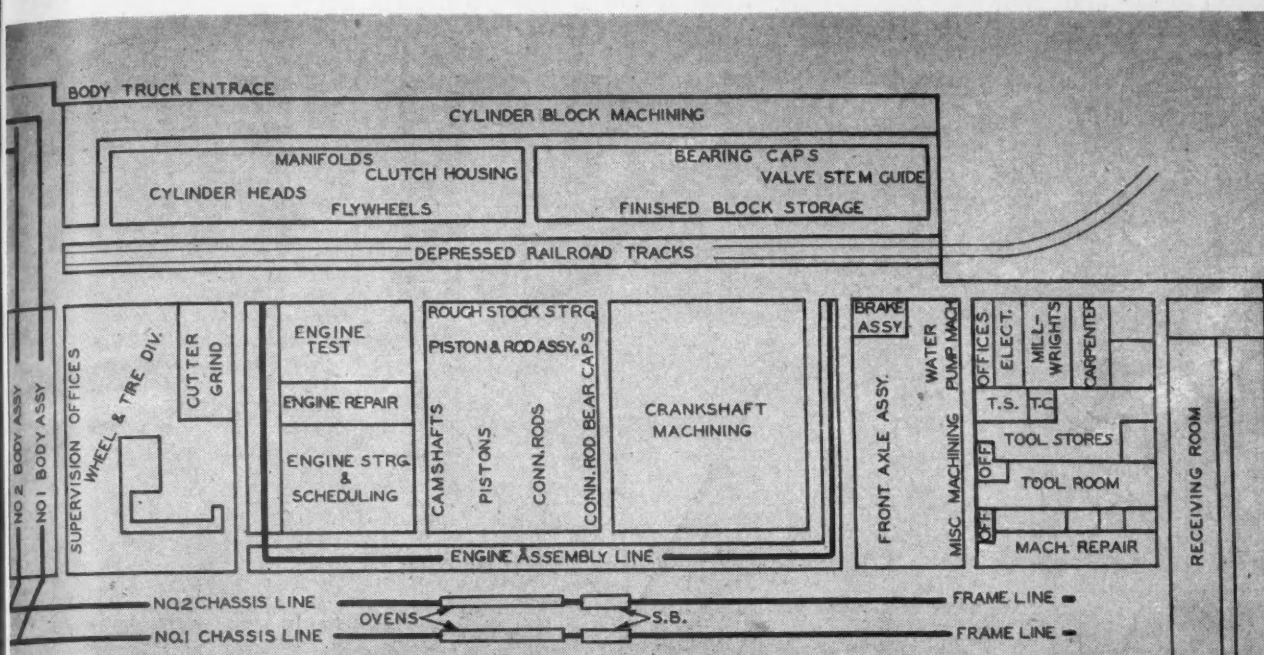
advantage of previous experience as well as the recent developments in mechanization and machinery.

Expression of advanced plant engineering is perhaps the most outstanding feature of this plant. The manufacturing operations in the main single-story structure have been expanded to a length of 2400 ft with a handsome modern office building at the front. The biggest change, however, is found in the introduction of an additional building communicating with the

main plant, housing what is called the "cast iron" operation. What they did was to shift all cast iron parts—cylinder blocks, manifolds, flywheel housings, flywheels, etc.—out of the original layout and arrange the machine lines in the new building. This move has many obvious advantages. The basic philosophy was to isolate cast iron machining from the rest of the plant and



Scheduling of sub-assemblies and vehicle options is one of the most vital activities in a motor car plant. Here is one of the many key scheduling stations at Plymouth, showing the telautograph instrument at one stage of the car assembly line



"Firsts"

Diagrammatic layout of new Plymouth floor plan.

at Plymouth's Enlarged Plant

particularly from the assembly operations, and to create long straight lines for cylinder block machining. Naturally, this also released a large productive floor space area in the main plant into which other operations were profitably expanded.

From the standpoint of plant layout Plymouth has created something of exceptional interest to everyone in the industry. Given free rein the management has introduced features at various points easily representing "Firsts" in mass production techniques. A sampling of these will form the backbone of this study and may be outlined as follows:

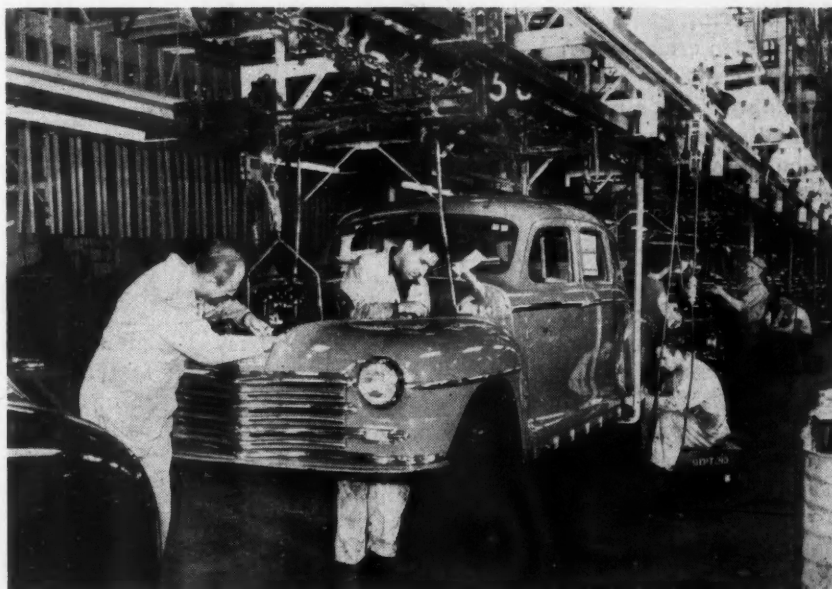
An entirely new system of final assembly lines.

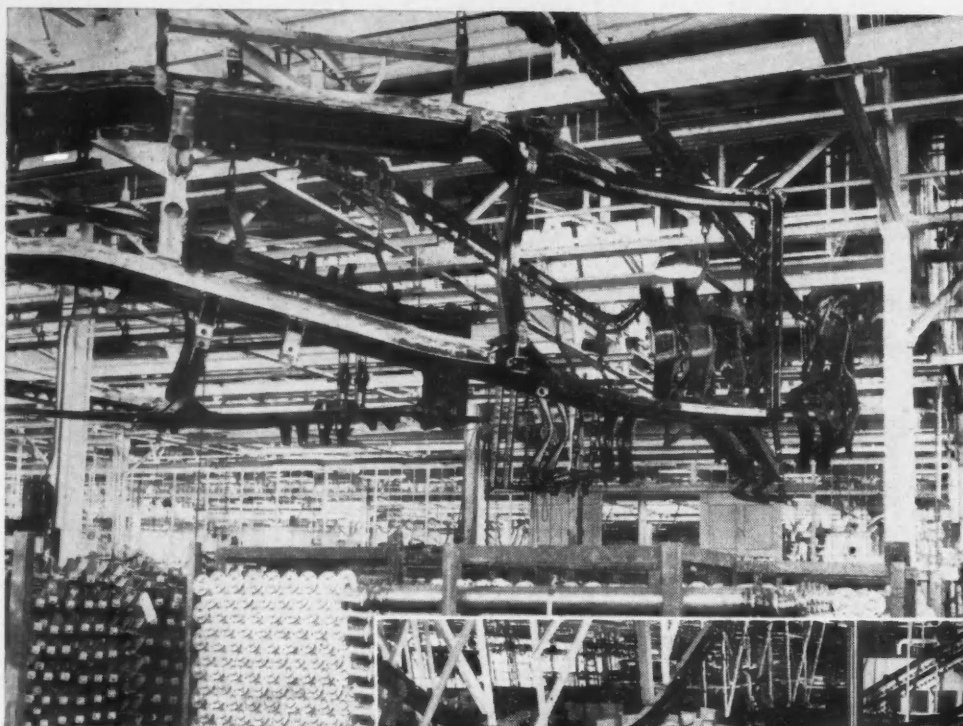
Development of monorail conveyor systems for most operations.

Unique chassis frame delivery line.

Assembly of sheet metal to the body prior to installation on the chassis line is the new wrinkle described in the text. This is a portion of the monorail conveyor linking the body trim lines with the final line. At this point, the conveyor dips to floor level to permit installation of sheet metal. Under normal operating conditions two of these lines will be in operation.

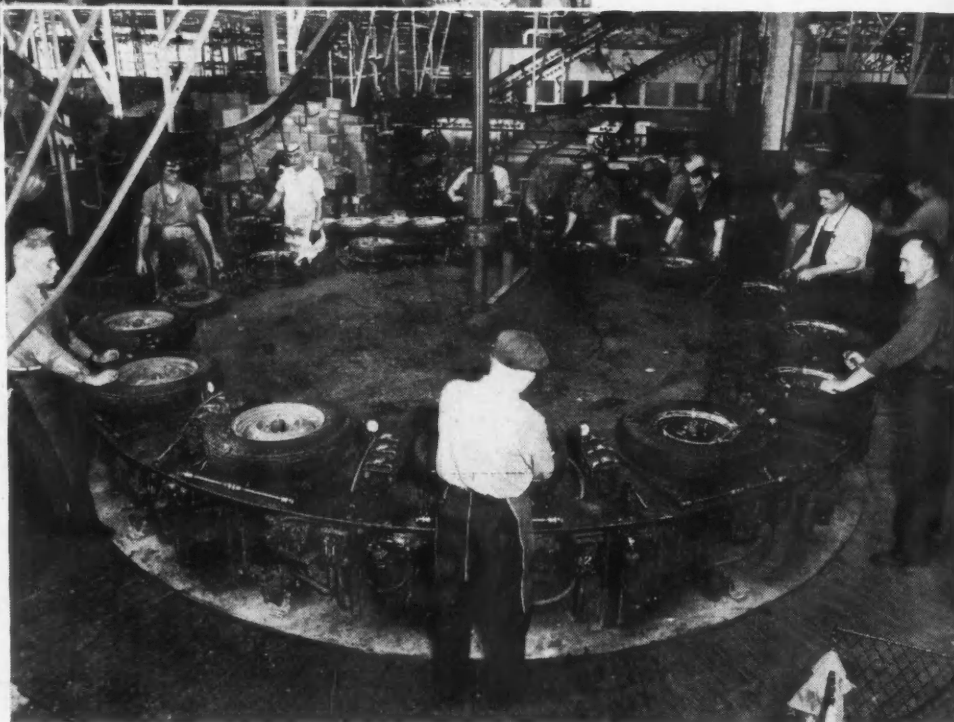
New Assembly Techniques, Automatic Spraying of Sheet Metal, an Extensive Network of Conveyors and the Housing of Cast Iron Machining Operations in a Separate Building Are Outgrowths of Previous Experience. In This Article Is Presented a Comprehensive Study of Accomplishments by Plymouth Management in Creating an Advanced Type Plant for Mass Production of Passenger Cars.





Left—Here is a peek at the frame delivery conveyor travelling at ceiling height and turning the corner before it reaches the start of the chassis line

(Below) Close-up view of one of the two large turntable machines for wheel and tire assembly. The huge arm, pivoted at the center carries the mechanism for rolling the tire into the rim.



New technique for body and sheet metal assembly.

New, semi-automatic body drop.

Automatic pick-up and automatic transfer from floor conveyors to monorails.

Interesting development of high production wheel and tire assembly.

Automatic spraying of sheet metal.

Possibly first use of "flotation" system for filtering grinding coolant in crankshaft department.

Impressive chip conveyor in cast iron department, handling up to 140 tons of chips per day.

The net work of monorail conveyors is so extensive that we have made a sampling of some of the longer lines just to give an impression of its scope. Some of the major lines will be described later.

The major shift to overhead conveyors for many operations—including a portion of the chassis assembly line—is of real interest to management. In a busy assembly plant it makes for better housekeeping and provides clear aisles for passage from one bay to another. This promotes safety since it is no longer necessary to use cross-over bridges on the final line or to wheel body dollies across aisles. Monorail conveyors provide an exceedingly flexible medium of transportation for an assembly plant. They can be bent or turned, formed into loops; they can change slope and

rise and fall. At Plymouth, for example, the monorails raise feeder lines to ceiling height when crossing aisles and drop to convenient working height to suit specific operations at floor level.

Floor Plan

To visualize the general arrangement of the plant, we have reproduced a small scale floor plan drawing showing each of the major functions in outline form. Materials and parts flow follows an interesting pattern. Bodies are received completely assembled, painted, and trimmed but without hardware and wiring and other details from the supplier and are delivered to the top central area of the building. Other parts and raw materials come in on the railroad freight spur depressed in the space between the cast iron building and the main plant. Chassis frames

Plymouth's Enlarged Plant

(Continued)

arrive at the extreme right hand corner at the top—by truck and by rail—and are suspended directly on the frame conveyor which transports them over the roof of the main building to the frame line at the lower right. Flow of parts and materials is then directly from the top through the various departments and finally to the two assembly lines running parallel to Mt. Elliott. We shall refer to the floor plan again in describing some of the major features of the layout.

At this point, however, it is important to comment on the general scheme of the arrangement of departments to provide the shortest path from fabrication or subassembly to the point of usage on the final assembly line. One example is the front suspension assembly, located at the extreme right and directly at the beginning of final assembly functions. Engine parts machining is closely grouped at the top and center sections and with motor assembly and block testing closely adjacent to the motor drop on the final line. Moving further to the left, we find wheel and tire assembly convenient to the wheel delivery stations on the final line.

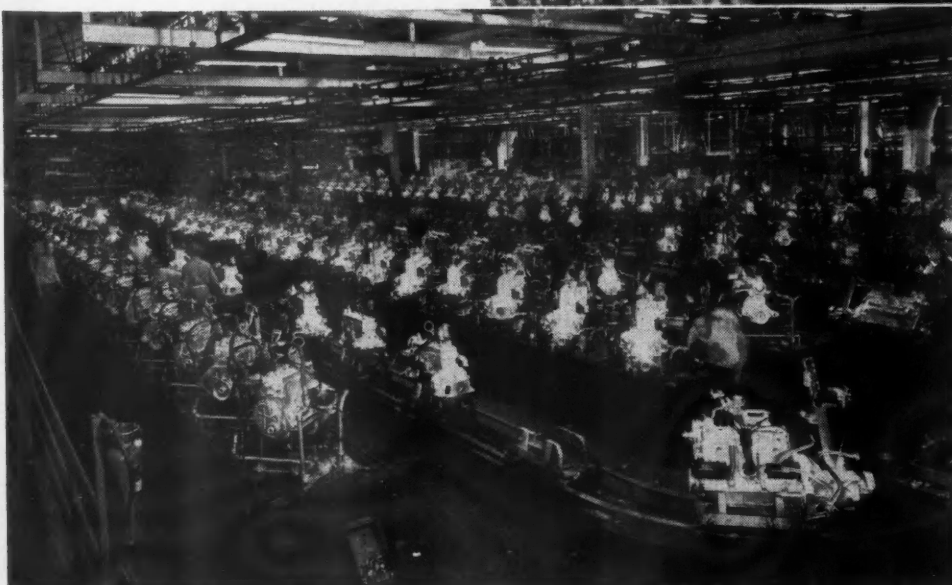
Body preparation, sheet metal sub-assembly, sheet metal prepara-

tion, and painting are grouped at the left and converge to the two body assembly line conveyors in the center aisle. From this point the body lines move directly to the body drop on the final line.

Conveyor Lines

Consider now a sampling of the major conveyor lines, some of the longest being singled out for this purpose. The overhead frame delivery line running from the extreme right corner, over the roof of the building and down to the start of the frame line is 1600 ft in length. In its passage over the roof, the conveyor traverses a long housing containing a steam blow-off chamber and an air blow-off. Regardless of weather conditions this scheme makes possible the delivery of clean frames free from rain or snow or dirt. As illustrated, this conveyor loops to return at the end

(Below) Here is a perspective of the enormous area devoted to block testing of engines. In the foreground is a portion of the distribution conveyor which links the department and traverses the eight test benches. The test benches with their service lines may be seen in this view. Under conditions of full production this department should be a beehive of activity with no gaps showing on the test benches or on the conveyor lines.



(Above) Bodies approach the body drop station while suspended on the monorail. The rigging directly overhead takes care of the automatic disengagement of front and rear end suspension carriers

Interior shot of one of the automatic spray booths mentioned in the text. This one handles hoods, two hoods being shown on the spinning fixture. A better view of this fixture may be seen at the right. Special fixtures are made for each type of part, the one for fenders, for example, taking four fenders at a time

of the frame line where the frames are lifted by an electric hoist and laid upside down on the frame conveyor.

The frame assembly lines are 350 ft in length and consist of floor conveyors about bench height to facilitate the integration of underbody running gear such as front suspension, rear axle, springs and propeller shaft. Part way up this line, to the left, the frame reaches a turn-over station where it is rolled over right side up by means of a counterbalanced arm suspended on an electric hoist overhead.

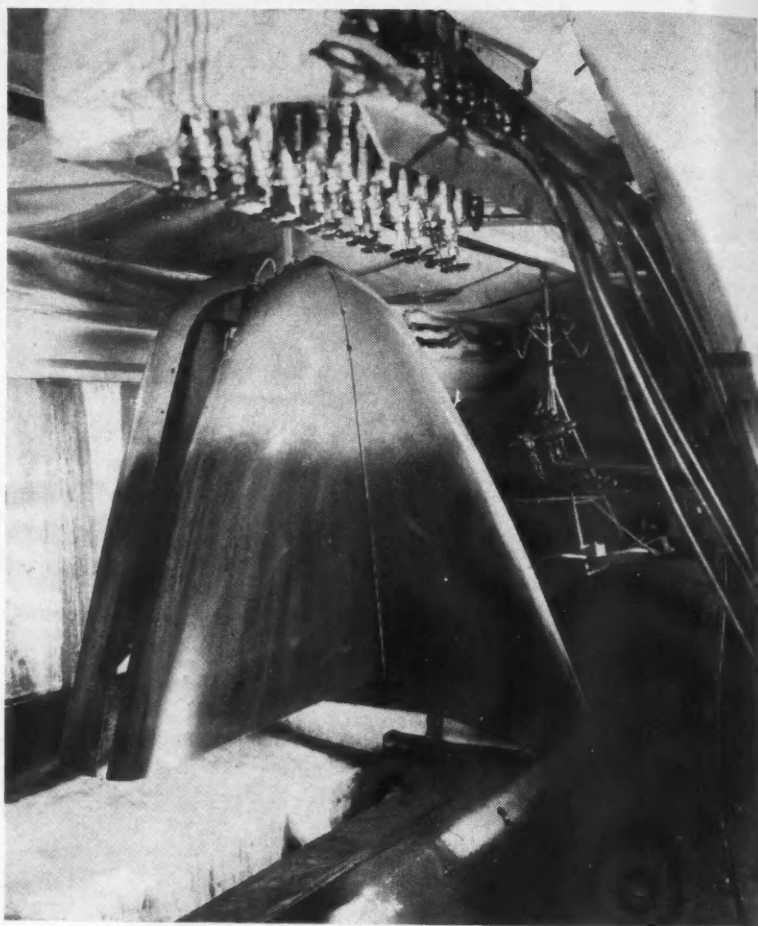
At the end of the frame line is one of the interesting features we mentioned earlier. Here the floor conveyor is met by the overhead monorail section of the chassis conveyor. As the frame reaches the end of the floor conveyor the line stops automatically. The monorail dips at this point and the front and rear suspension arms, guided by rails, engage the chassis automatically without the aid of an operator. The overhead lines, each 380 ft in length, carry the chassis through spray booths, then through the adjacent drying ovens. Major advantage of this method is the facility with which frames can be sprayed without missing hard to reach points while freely suspended from a conveyor. The drying ovens are ceiling suspended so as to provide a clear aisle space below.

As the overhead line reaches the start of the final assembly conveyor, it dips and deposits the chassis and automatically releases it. Here the suspension arms are withdrawn from engagement by means of a series of guide rails.

The two final assembly lines, said to be the longest straight lines in the industry, are of flush floor type and extend some 960 ft before they reach the roll test and wheel alignment stations at the extreme left end.

At the start of the final line, we meet the wheel delivery conveyor—a monorail running 500 ft in length—from wheel and tire assembly to the assembly line chutes. These assemblies come in on the monorail at ceiling height and as they reach the conveyor chutes they are automatically picked off the hooks and dropped into the proper chute. Each line has two chutes, one for each side. The pick-off mechanism is designed to drop a front and a rear wheel pair into each of the chutes.

For the motor group there is the floor assembly conveyor 1150 ft in length; motor parts delivery monorail to the motor assembly line—1700 ft long; and a 1500-ft monorail and floor conveyor combination for



motor distribution through block test and to storage. One of the longest of the monorail lines is the motor shipping conveyor which transports tested engines to the shipping dock at the extreme upper left for delivery to Plymouth assembly in Los Angeles and elsewhere. This is a 3000-ft line. Another of the long monorail systems is the 2600-ft carton conveyor, so-called, delivering many parts received in cartons from suppliers to assure freedom from breakage or scratching. The sub-assembly stations receive the cartons, then return the cartons on the same conveyor after parts have been unpacked. It may be noted that this represents one of the most profitable salvage operations in the plant.

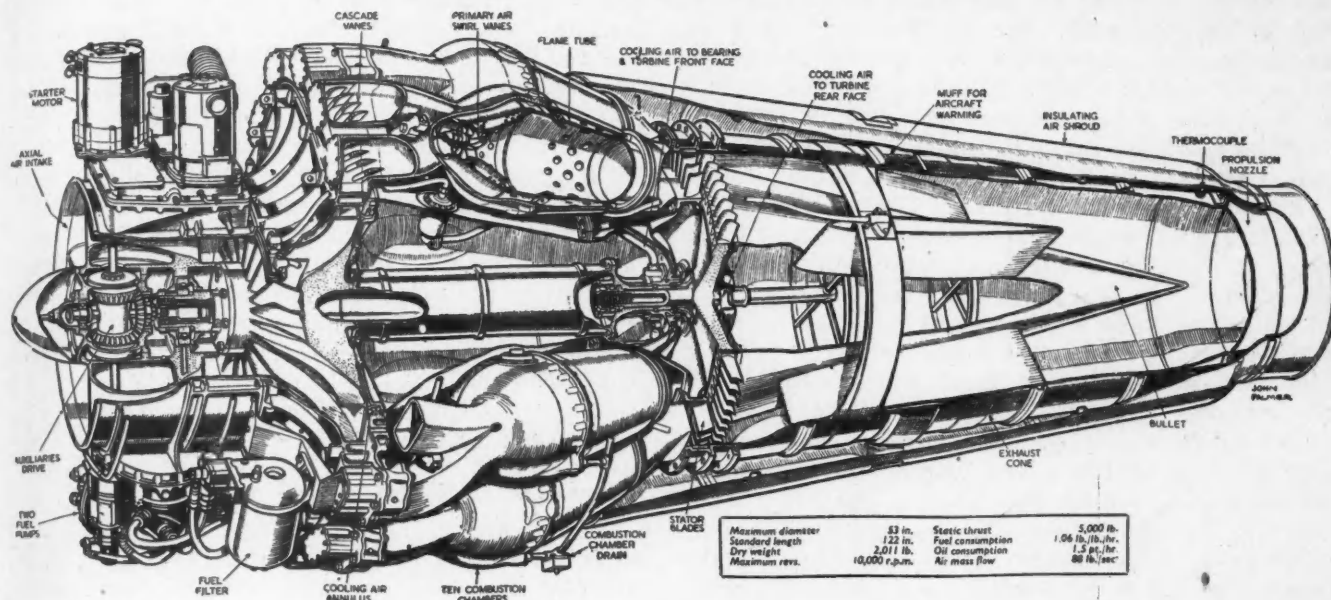
Longest monorail is the 3600-ft conveyor for distribution of black enamel parts and gas tanks.

Body Operations and Delivery

As mentioned earlier, bodies come in from an outside plant, then are scheduled to the body hardware assembly lines, 520 ft in length. At the end of the hardware line, bodies are picked off the dollies by the body assembly monorail, a system some 520 ft long. Bodies are now on the lateral line running from the upper end transversely to the final line. At the start of this monorail line, we find a unique procedure for handling front end sheet metal assembly.

Latest conventional practice in the industry has been to drop the body on the chassis, then add a front sheet
(Turn to page 78, please)

de Havilland Ghost



SHOWN here in a cutaway drawing is the de Havilland Ghost, one of Great Britain's latest jet engine developments. Its weight (dry) is 2011 lb and maximum static thrust output 5000 lb at 10,000 rpm. Design features include a single-sided impeller fed by a high-velocity intake duct, a straight-through combustion system and a single-stage axial turbine with direct

ejection. The 84 stator blades are stampings of Jes-sops G18B steel and the 97 turbine blades are individual forgings of Nimonic 80 alloy.

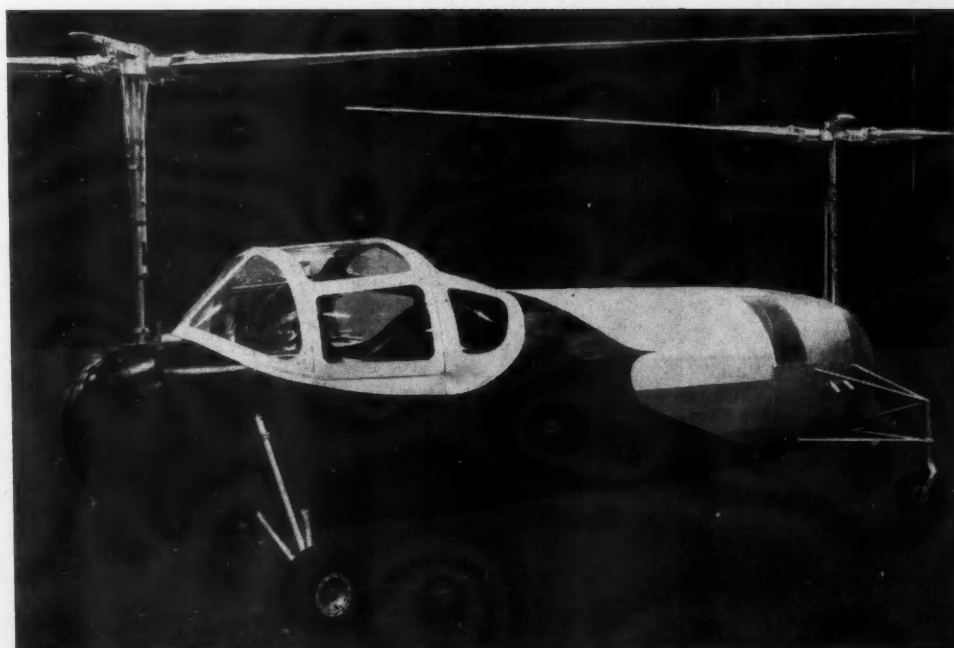
Standard length of the engine is 122 in. and over-all diameter 53 in. It is to be installed in de Havilland Vampire and Avro Lancaster aircraft.

(Courtesy of *Flight*, London)

New deLackner Helicopter

Designed for Low Cost Production

This twin-rotor helicopter, designed for low-cost production by deLackner Helicopters, Inc., Tuckahoe, N. Y., is powered with a 125 hp Lycoming engine located in the rear end of the fuselage. The forward rotor is driven by means of a longitudinal shaft running the length of the fuselage. The twin-rotor design is claimed to simplify control for the operator, since the counter rotation of the rotors eliminates torque. Thus the rudder is used only to turn the craft right or left, with principal control possible through use of the throttle and a collective pitch lever. The two rotors are 24 ft in diam, and drive the craft at a maximum forward speed of 100 mph. Gross weight is 1600 lb, including two persons and twenty gallons of gas. The helicopter shown here is the prototype



IN PART I of this article reference was made to the development of silver bearings with a thin lead overlay for use in aircraft engines. When first tried in engine bearings, without the overlay, silver proved to be rather erratic. Fortunately, the beneficial effects of the overlay were discovered just prior to the war, and as a result practically all engines installed in war-planes were equipped with silver bearings.

Practices in the manufacture of silver bearings for Wright aircraft engines were described in the ASM paper of Palsulich and Blair. Normally the silver is deposited on the steel backing after a preliminary nickel "strike," and is then annealed for one hour at 950 F to set the bond and to refine the grain. In certain cases where the steel backing is case-hardened, the annealing operation is conducted at 325 F-500 F to prevent drawing of the case, and is then extended over a period of two hours. Before the somewhat tedious plating process was adopted, the silver was cast into the steel shells and then machined. In order to provide a reliable bond it was necessary to first copper-plate the shells. Casting the silver did not give satisfactory results because: the cast metal tended to be porous; the bond often was imperfect; and the grain size was large. The plating process was developed until a rate of deposition of 0.015 in. per hr was attained in regular production, as compared with 0.001 in. per hr in normal silver-plating operations.

The greater hardness of silver as compared with

tin and lead alloys involves a lower embedability, and the early experience with silver was not entirely satisfactory. Fine particles of grit that got into the bearing could not embed themselves and caused cutting or scoring. Annealing, of course, softens the metal, but not sufficiently to give the desired embedability. To overcome this deficiency, the bearings were provided with a thin overlay of lead, which was alloyed with indium to make it more corrosion-resistant.

In master-rod and crankshaft bearings Wright uses a nominal silver thickness of 0.020 in. and an overlay of 0.001 in. All other bearings are made with a silver thickness of 0.010 in. and an overlay of 0.005 in. On steel-back copper-lead bearings the lining is made 0.020 in. thick. Steel backings normally have a thickness of 0.080-1.100 in., but backings as thin as 0.050 in. have been used successfully.

Inspection Methods

When a change is made to new materials of construction or to new production methods, new, more rigorous inspection techniques are generally considered necessary. This applies particularly in the case of

Latest Developments

Part Two Production, Inspection, and Test Methods for Aircraft-Engine Bearings

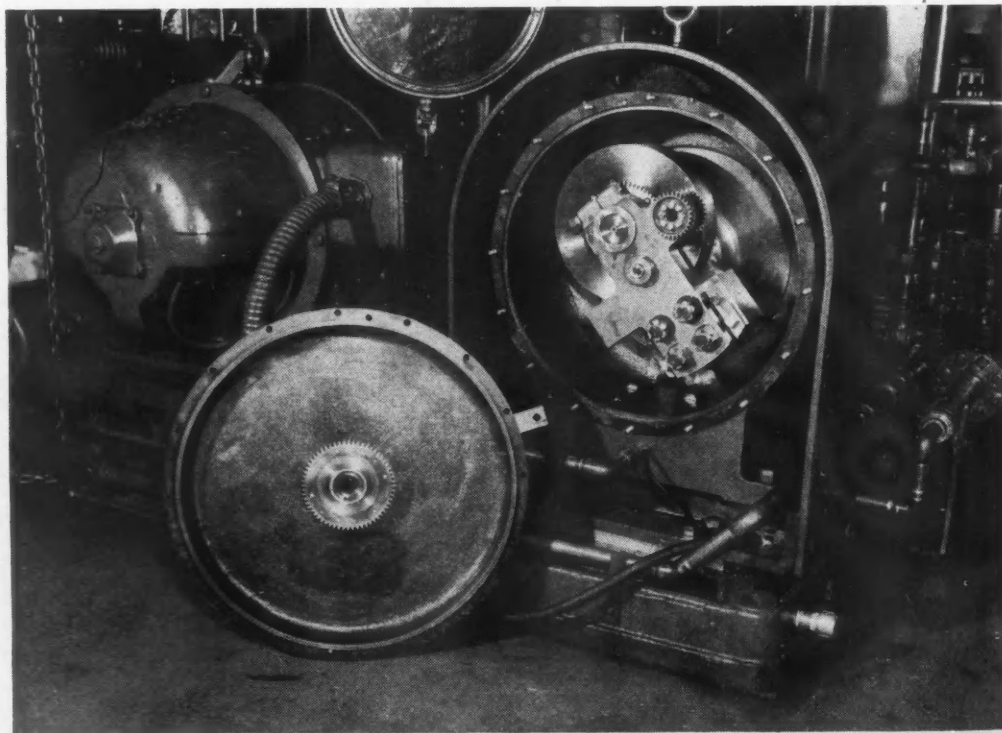


Fig. 1 — Machine for testing master-rod bearings for load capacity

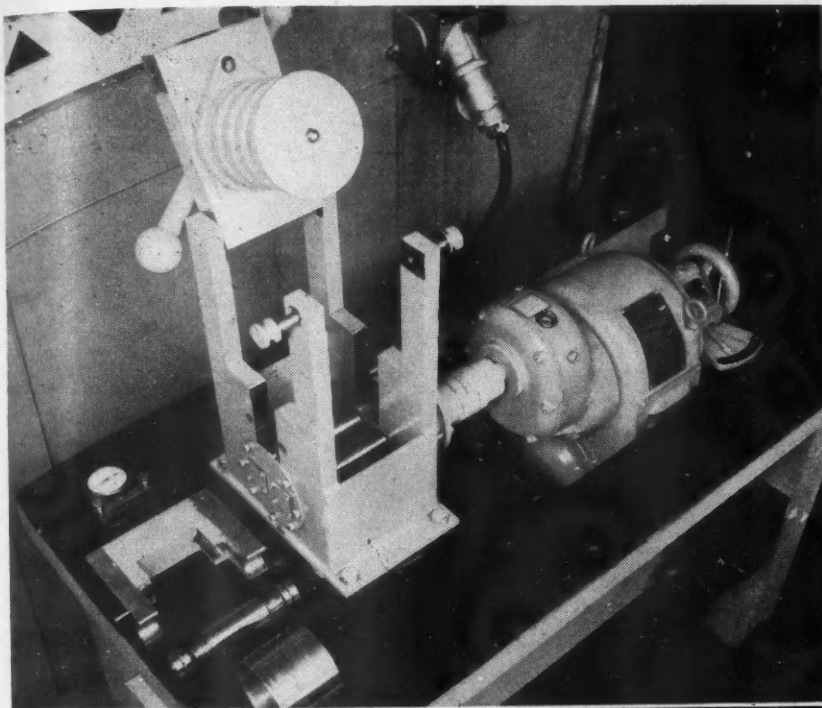


Fig. 2 — Wright Aeronautical Corp. uses this test rig for determining fatigue resistance of bearings

**By
P. M.
Heldt**

in Engine Bearings

such products as aircraft-engine parts, premature failure of which in service might have serious consequences. In the production of silver bearings for aircraft engines, silver of a high degree of purity (99.95 per cent) is used. Master-rod bearings for Wright engines are subjected to both X-ray and black-light inspection, while other bearings are subjected only to the black-light test. These inspections reveal imperfections in the bond, porosity, and inclusions. A poor bond is revealed also by visual inspection after the bearing has been annealed, as the high annealing temperature of 950 F or 1000 F will cause the silver to form a blister where it is not properly bonded. Another inspection applied to silver bearing is known as the fluorescent test. The bearing is immersed in a fluorescing oil, and if there are any small surface cracks or if the silver is not perfectly bonded to the backing, oil will be drawn into the crevices by capillary attraction. The bearing is then cleaned of oil by wiping and subjected to heat which, by reason of expansion of the metal, forces the oil out of the capillary spaces. The defects can then be detected by throwing ultraviolet light on the surface, under which the oil exuding from the cracks fluoresces.

Load-Capacity Tests

Tests for load-carrying capacity of aircraft-engine bearings are made in a machine (Fig. 1) which simulates the loading conditions of a master-rod bearing

of a radial engine. A crankshaft corresponding to that of the engine is used, and the bearing to be tested is inserted in a bob-weight mounted on the crankpin. Bearing load is created by the centrifugal force on the bob-weight as the crank is rotated by an electric motor. In order to cause the bearing to revolve on the crankpin at the same mean rubbing velocity as in engine operation, a gear train is introduced, one member of which, concentric with the crankshaft, is held from rotation by a torque arm. Means are provided for measuring the torque exerted on this arm when the testing machine is in operation; for controlling the pressure and temperature of the oil supplied to the bearing during the test; and for measuring the rate of oil flow. In addition, when there is a considerable increase in the bearing friction, in case of an incipient seizure, the current supply to the motor is automatically cut off and the machine is stopped before any serious damage can be done.

I understand that this bearing-testing machine was originated by the Pratt & Whitney Aircraft Division, United Aircraft Corp., and developed further by the Wright Aeronautical Corp.

In a test for bearing-load capacity the bearing is first "run in" for a given length of time at a moderate speed of the machine. The speed is then increased 200 rpm at a time, and the machine is run for a given length of time at any given speed. When the expected load limit is approached, the speed increments are reduced to 100 rpm, and the duration of the run may also be changed. The test is continued until the bearing fails by seizure. In any given series of tests, the speed increments, the period of running at a given speed, and the speed at which the increment is changed remain constant in order to obtain a valid comparison



Fig. 3—Taber Abraser for making wear tests

between different materials and production methods, but different values may, of course, be used by different manufacturers. In such tests in the Wright laboratories, oil having a viscosity of 120 SUS at 212 F is fed to the bearing at 185 F and 70 psi. The crankshaft speed is increased in steps of 200 rpm from 1000 to 2600 rpm, and then in steps of 100 rpm until failure occurs, runs within the lower speed range extending over 15 min and those in the upper over 20.

In the engine both the load and the rubbing velocity on the master-rod bearing undergo cyclic variations, while in the testing machine both are constant. The mean bearing load and the mean rubbing velocity for any condition of engine operation can be readily calculated, and the behavior of the bearing in the engine under a given mean load is assumed to be the same as that in the testing machine under an equal constant load.

Fatigue Tests

Engine bearings often fail by fatigue, and tests for fatigue life or fatigue resistance therefore are also made on different bearing types.

Bearing failure by fatigue calls for some discussion of the phenomenon. It is easy enough

to see how such a member as a leaf spring, for instance, can fail by fatigue, as its elements are constantly bent or flexed back and forth; but the exact nature of fatigue in a bearing is not so obvious. It may help to get a true conception of the phenomenon if we consider that the load on the bearing is not uniformly distributed over the entire projected area, but very irregularly, being most intense at the element of the bearing surface which is intersected by the radial line which indicates the direction of the load. We can form an exaggerated picture of the non-uniformity of load distribution by assuming the load to be applied to a journal or cylinder supported by a plane surface. All of the load would then be supported on a narrow strip of the surface close to the line of closest approach, and this part of the bearing would be elastically deformed. If the journal were pushed along over the bearing strip, this zone of elastic deformation would travel along with it, and all of the bearing metal would be successively subjected to compres-

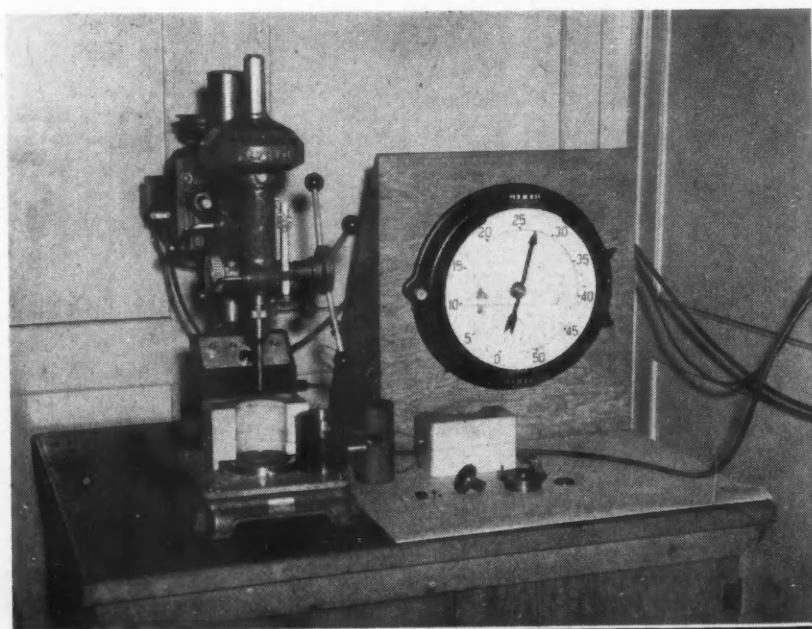


Fig. 4—Bearing corrosion tests are made in this apparatus by the Shell Development Co.

Latest Developments in Engine Bearings

(CONTINUED)

sion, from which it would recover by elastic rebound. It is not difficult to visualize a ridge of bearing metal being thrown up in advance of the line of closest approach, followed by a depression at that line. In the actual bearing the supporting surface is not a plane but a cylinder of only slightly larger diameter than the journal, and load concentration therefore is less severe, but the nature of the deformation is the same. Constant repetition of cycles of compression and expansion finally cause the surface metal to crack.

Fatigue-life tests of bearings for master connecting rods are made by Wright Aeronautical Corp. by means of the simple testing rig illustrated in Fig. 2. The bearing is supported on two power-driven rollers and is distorted by means of a load roller extending through it and subjected to load by a coil spring. A standard of comparison is obtained by subjecting a production bearing to the test. The speed of the driving rollers can be varied between 150 and 700 rpm; and the testing rig is so designed that the specimen can be easily inserted and removed, so that inspections of the bearing surface can be made without much loss of time. Inspections are made at intervals of from 30 to 60 min, depending on the material. During the test the specimen is partly submerged in oil.

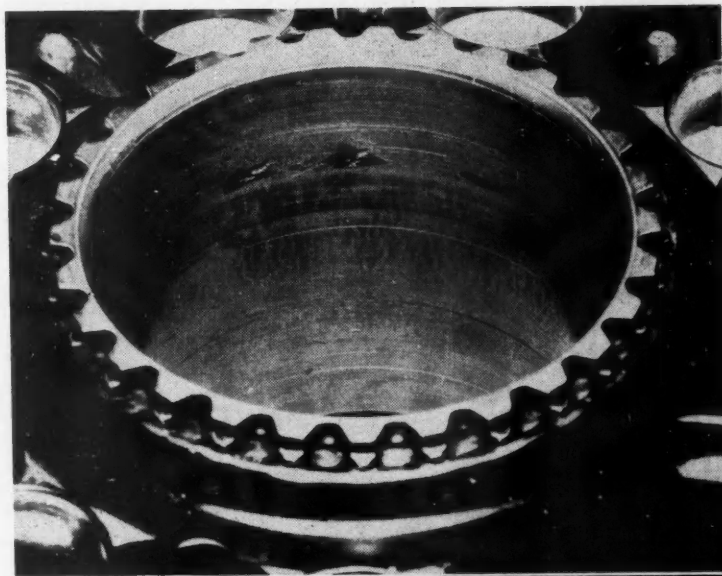
Fatigue Resistances of Alloys

From a table of fatigue-test results included in the paper by Palsulich and Blair, it is seen that a steel-backed silver bearing had a fatigue life of 1.5 hr under a load of 1000 lb, and 150 hr under a load of 450 lb. How the overlay improves bearing performance is indicated by the fact that, with such an overlay, the fatigue life under 1000 lb was increased from 1.5 to 15 hr. Bearings of other materials were tested under a load of 450 lb, and under this load the fatigue lives of various bearings were as follows: steel-back copper-lead, 4 hr; solid bronze (three grades), 17.5, 125, 500 hr; solid aluminum (three compositions), 6, 5.5, 165 hr. Of the three aluminum alloys, the first contained 6 per cent tin and 1 per cent of copper and nickel each; the second, 6 per cent tin, 0.5 per cent nickel and 1 per cent copper; and the third (which was a malleable alloy), 0.15-0.40 per cent copper, 0.70 per cent iron, 0.40-0.80 per cent silicon, 0.15 per cent manganese, 0.80-1.20 per cent magnesium, 0.20 per cent zinc, 0.35 per cent chromium and 0.15 per cent titanium, according to specifications.

Arthur F. Underwood, General Motors Laboratories Division, who made reference in his paper to three different types of fatigue-testing machines, including the one described in the foregoing, rates the different bearing metals in the following order with respect to fatigue resistance: bronzes, silver and copper, alumi-

num alloys, copper-lead containing tin or silver, bab-bitt in thin overlays (0.003 in. or less), copper-lead, cadmium alloys, lead- and tin-base babbitts. He points out, however, that the ratings are only approximate, because the fatigue resistance of bearings depends on the manufacturing technique employed. The position of aluminum alloys, particularly, is uncertain, because these have not been used extensively so far, and as more experience is gained with them their rating may change.

Fig. 5—A master-rod bearing damaged by cavitation erosion



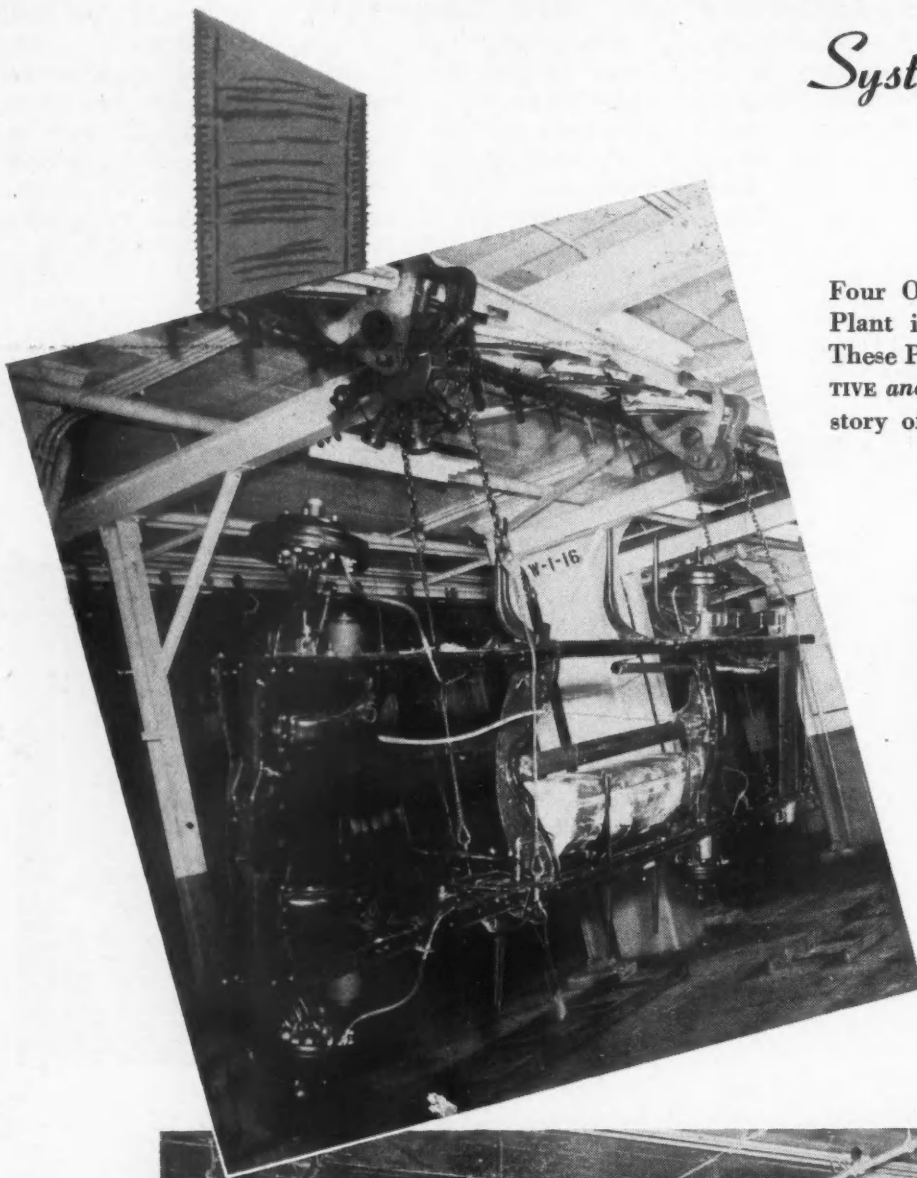
Wear Tests

Wear tests on bearing materials are made on the Taber Abraser (Fig. 3), in which wear is produced on a test specimen, mounted on a rotating table, by a pair of rubber-bonded abrasive wheels pressed against it by a weight on a loading arm. The axis of the abrasive wheels is offset from that of the table, hence there is sliding motion between the wheels and the specimen, and a consequent abrasive effect on the latter. The curved abrasion lines produced by one wheel cross those produced by the other. Tests are made without lubricant on the wearing surfaces, and the results obtained are said to be reproducible within 5 per cent. Tests are made under a standard load, and the wear is expressed in terms of weight loss during a given number of cycles. The wear naturally varies inversely as the hardness. A number of bearing materials tested on this machine were found to follow one another in

(Turn to page 62, please)

New Mechanical

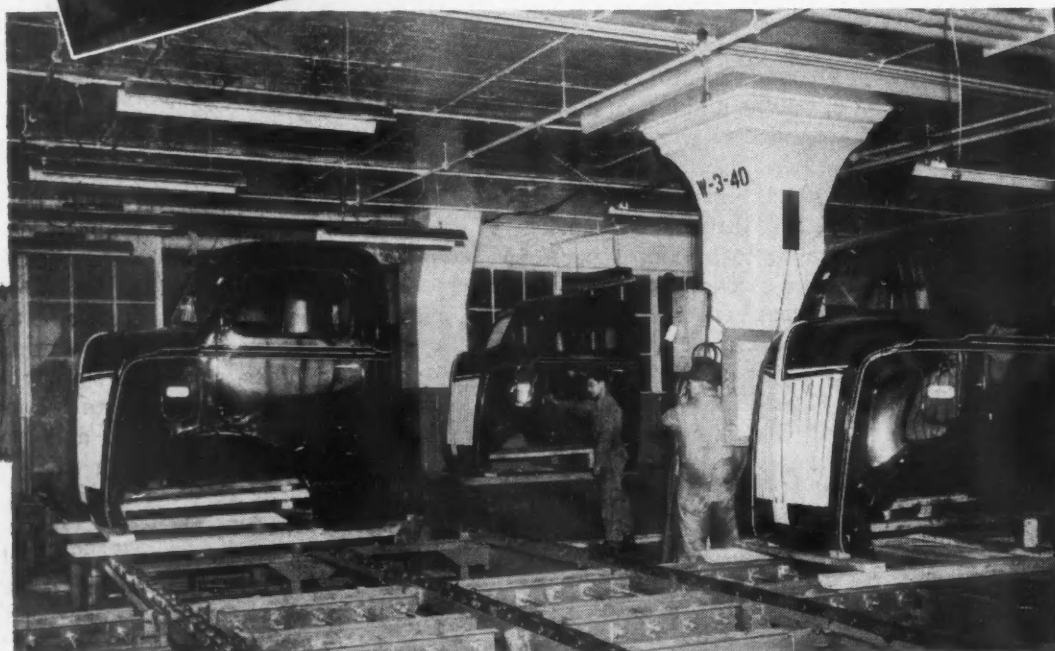
Systems Speed Truck



Four Outstanding Developments at Ford Plant in Highland Park Are Shown on These Pages (see March 1 issue of *AUTOMOTIVE and AVIATION INDUSTRIES*, page 52, for story of newly-opened Ford truck plant)

(Left) Automatic chassis roll-over conveyor in the Ford truck plant. This view shows the chassis in up-side-down position being hoisted onto the monorail. As the line progresses to the left, in this view, a series of guide rails cause the spoked wheel at the left to deflect through a given angle. Each of the guide rails shown near the ceiling moves one of the spokes. The frame has been deflected to an angle of 85 deg before it enters the spray booth.

(Below) Automatically-controlled transfer station serves to move cabs from the receiving line in background, to one of a number of storage line conveyors. The cab in the background is riding on the transfer chain and will move into the foreground for the transfer maneuver.



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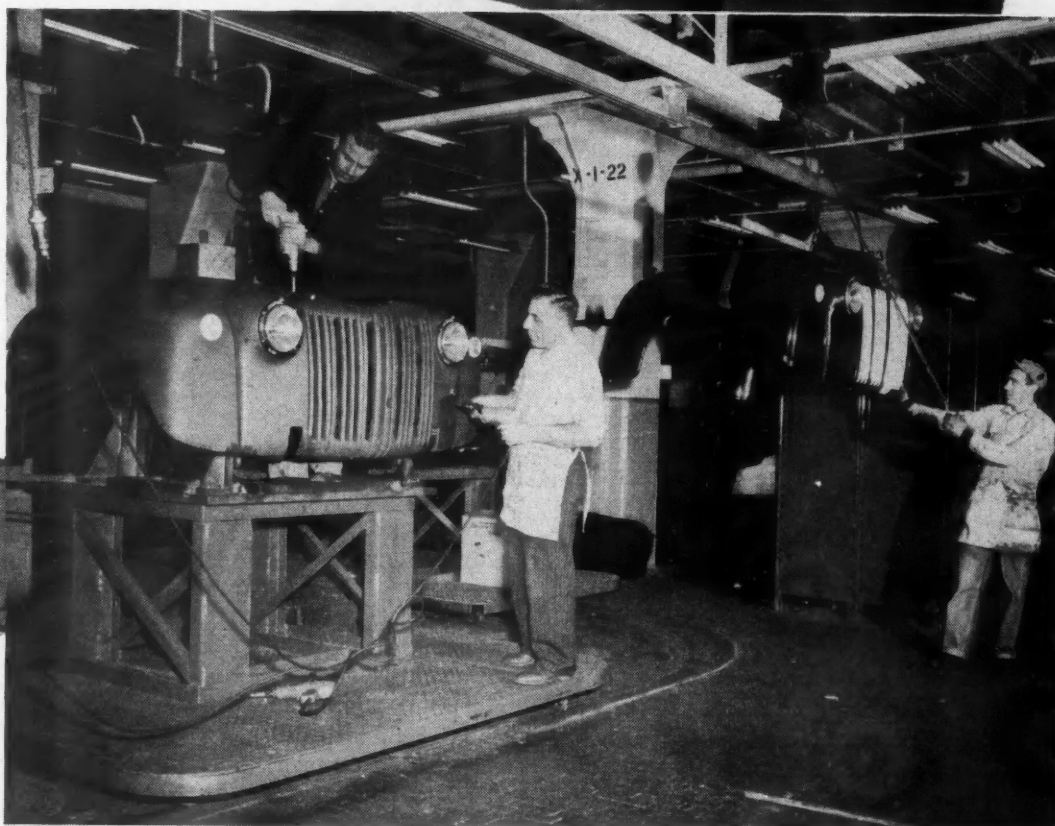
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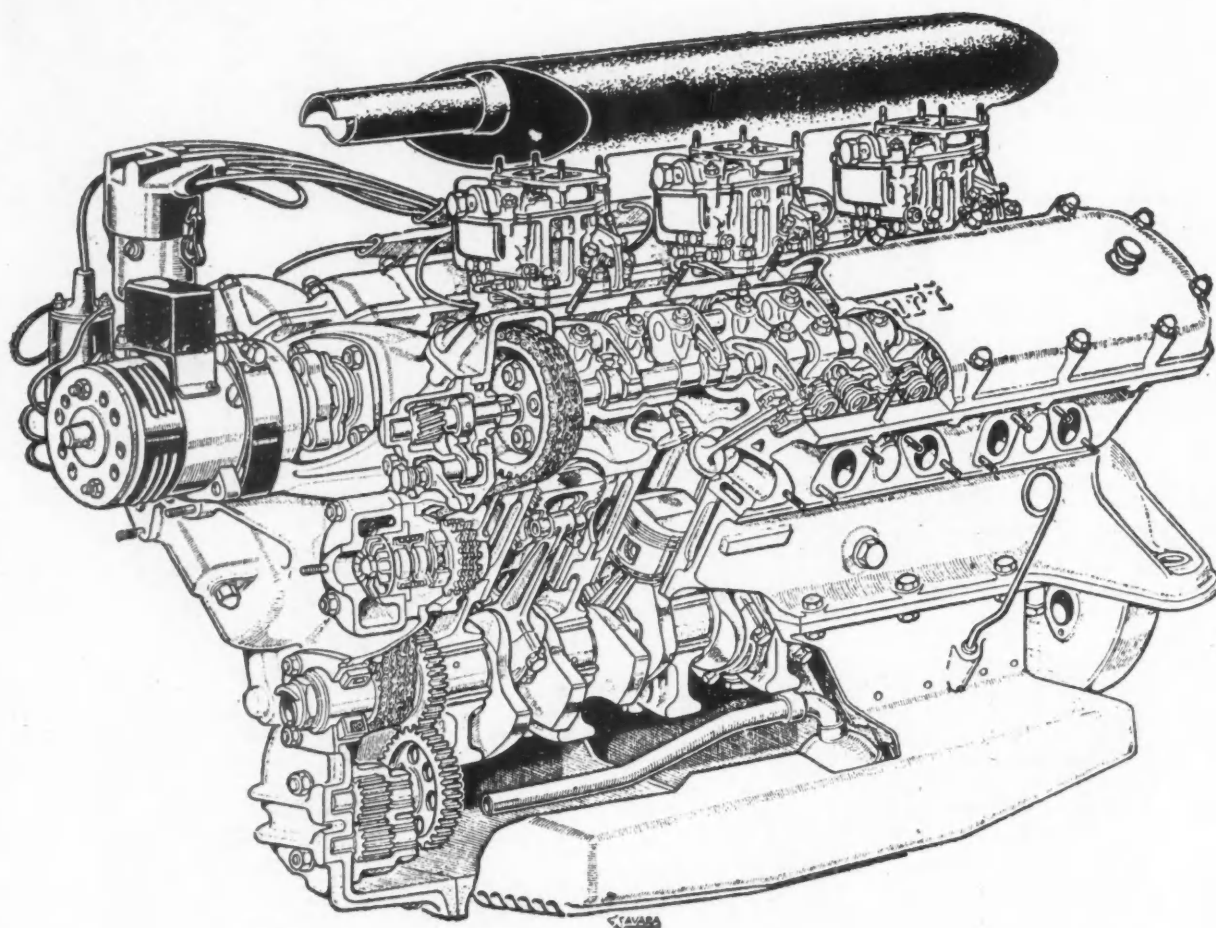
(Right) Close-up of a new wheel and tire ring rolling machine installed on the line in the Ford truck plant. Wheel and tire assemblies are placed on the table in the center, then the table is elevated automatically within reach of the three rollers, which are pressed down while spinning around the ring.

(Below) Here is one of the 14 stations on the front end sheet metal assembly merry-go-round. Platforms are guided around the circuit by the power chain at the inner edge of the platform.



April 1, 1947

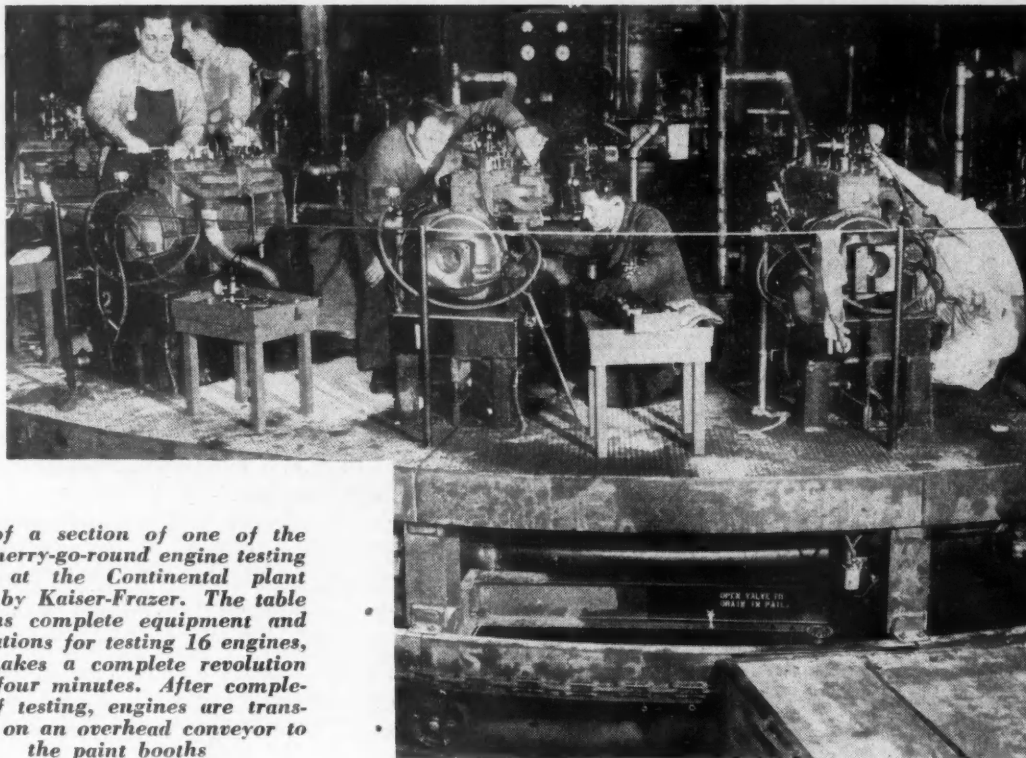
New Italian V-12 Engine



S HOWN here is the new V-12 Ferrai 125-S engine, preliminary details of which were given along with a description of the Italian sports car it will power in the Feb. 1 issue of *AUTOMOTIVE AND AVIATION INDUSTRIES*, page 67. This engine has a piston travel of slightly more than two inches, which permits it to be run at abnormally high rpm while still retaining a moderate piston speed. Each bank of cylinders has one camshaft and is provided with a detachable aluminum alloy cylinder head containing two valves per cylinder. The two banks are at an angle of 60 deg. The valves are inclined at 60 deg and seat upon hard inserts. The cylinder block is an aluminum alloy casting fitted with cast iron liners. Pistons, clutch and

transmissions housings also are of aluminum alloy.

Reciprocating weight of the valve gear has been reduced by the use of duplex hair-pin valve springs. Three twin choke Weber carburetors of light-metal alloy are mounted in the center of the block. Air enters through a forward facing scoop leading to a special intake carried past the radiator, thus eliminating effects of high under-hood temperature on the power output of the engine. With a compression ratio of 8 to 1, this engine will develop a maximum of 72 bhp at 5600 rpm. Bore is 2.16 in.; stroke is 2.06 in.; and the displacement is 91.3 cu in. (Drawing reproduced by courtesy of *The Motor*, London, and *Inter Auto*, Italy).



View of a section of one of the huge merry-go-round engine testing tables at the Continental plant leased by Kaiser-Frazer. The table contains complete equipment and installations for testing 16 engines, and makes a complete revolution every four minutes. After completion of testing, engines are transferred on an overhead conveyor to the paint booths

Unique Merry-Go-Round

Speeds Engine Testing

A UNIQUE innovation at the Continental Motors plant in Detroit, now operated by Kaiser-Frazer Corp., is a huge merry-go-round table for final inspection and tune-up of engines. Two of these merry-go-rounds are now in use, and two more are currently under construction. The installation, illustrated on this page, consists of a large diameter table mounted on wheels and rotated by a power drive engaging a chain just above the rollers. Engines are mounted on test stands in conventional fashion, each unit having 16 block test stations. Speed of the machine is so adjusted that a finished engine is delivered for each revolution. Interesting feature of the machine is that all service supply for engine testing: fuel; water; lubricant; and lubricant rectification, is centralized in equipment which is housed in the central column of the unit. Thus it is self-contained and carries all service piping as it rotates. Accepted engines are transferred by crane to an overhead conveyor which transports engines through a paint spray booth and an adjacent infra-red oven for baking the finish.

When the Continental plant was first tooled for making engines for the Kaiser-Frazer Corp., it was equipped with several million dollars worth of equipment, much of it of advanced type. On March 1, the Kaiser-Frazer Corp., under the lease arrangement by which it will operate the Continental plant, began a systematic arrangement of departments and machinery to improve the flow of materials and operations. In addition, some important items of equipment have been installed or are in the process of installation. Engine production is continuing apace during the changeover and is expected to hit a high level within less than 60 days, although it will take longer to effect full daily goals.

The plant, now known as the Kaiser-Frazer Detroit Engine Division, is headed by E. J. Hunt, and has a floor space in excess of 260,000 sq ft, with the possibility of further expansion. It is understood that the output of the new division will be augmented with engines produced by Continental in its Muskegon plant until peak production has been attained.

trated in Fig. 1 of Part I, have been built previously in considerable variety of constructions, but mostly for laboratory use for highest sensitivity, incorporating water cooling, delicate procedures for clamping the diaphragm, and other undesirable features which render them unsuitable for engineroom use. Therefore it was necessary to design the pickup from the basic requirements of the intended engineroom use, without reference to previous constructions.

Design Features

MANIFOLD—The manifold is built of a metal block, drilled and tapped to receive the fill valve and release valve, the pressure gage, and the insulated connectors for the pressure tubing. Fig. 4 shows a 16-station model combined with the switch panel incorporating outlets to receive the connections for the battery and for the neon lamp, and the 16 circuit switches for the 16 pressure pickups. At the bottom is mounted a container for silica gel or other desiccant, for removing any moisture which may be present in the balancing pressure gas, and which, if not removed, may find its way between the diaphragm and the insulated terminal of the pickup and cause a false contact indication. A false contact can be recognized by the lighted arc extending over the complete 360 deg of rotation.

PICKUP—Diaphragm-type pressure-responsive contactors as described and illus-

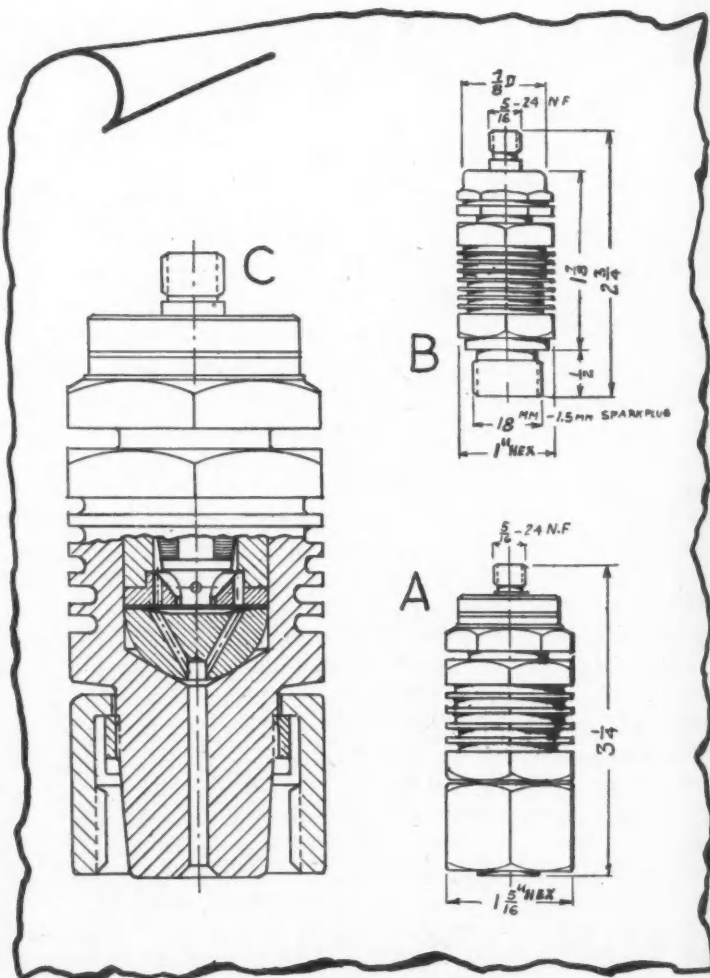


Fig. 5

**A—Large Pickup ($\frac{3}{4}$ in. diaphragm diam.,
9/16 in. free diam.) with cone and nut con-
nection to indicator valve
(U. S. Pat. 2382547)**

B—Small Pickup (9/16 in. diaphragm diam., 7/16 in. free diam.) for direct screw connection to cylinder head

C—Section of large pickup showing internal construction. Diaphragm is clamped between hemispherical lower clamping member and flat-lapped upper clamping member

Indicator for Routine of Multi-Cylindered Engines

By Kalman J. De Juhasz,

Professor of Engineering Research,
The Pennsylvania State College

Part Two

Design Features

most advantageous manner and as free from error-causing influences as possible. Further practical requirements are ease of cleaning and replacement of the diaphragm. Therefore dismantling and reassembling should be simple operations requiring no special skill.

Errors of the diaphragm are of two kinds:

- (1) Delay of response, affecting the accuracy of the crank angle reading, that is the abscissa variable.
- (2) Sensitivity error and zero error both of which affect the pressure-reading, that is, the ordinate variable. In order to mitigate these errors it is necessary
 - (a) to use as thin and light a diaphragm as permitted by considerations of strength and useful life;
 - (b) to clamp the diaphragm in such a manner that it is not distorted;
 - (c) to keep the temperature of the diaphragm fairly low and not changeable, so as to minimize distortion due to temperature causes.

It has been found desirable to construct pickups in two sizes: one for large Diesel engines, for a diaphragm of $\frac{3}{4}$ in. diam (9/16 in. free diam) shown in Fig. 5A, and another for small, high speed engines of automotive and aero type, for a diaphragm of 9/16 in. diam (7/16 in. free diam), shown in Fig. 5B. The internal construction and method of clamping is the same in both and is shown in its essentials in Fig. 5C. The essential features of this construction are: (1) directing the heat flow away from the diaphragm, (2) clamping the diaphragm with uniform pressure between two flat lapped surfaces.

The pickup body is provided with cooling fins, and its inside cavity is formed with a conical bottom which communicates with the engine space by means of a drilled passageway. The diaphragm is clamped between a lower and an upper clamping member. The lower clamping member is of approximately hemispherical shape and is seated with its spherical

surface on the conical bottom of the pickup cavity, and its upper surface is adjacent to the diaphragm. This upper surface is formed with a peripheral annular clamping area in firm contact with the peripheral portion of the diaphragm, and within it is a shallow recess allowing the diaphragm a few thousandths of an inch deflection in the downward direction. The space in the recess is connected by means of drilled holes with the passageway to the combustion chamber, whereby the lower surface of the diaphragm is exposed to the fluctuating engine pressure. The upper clamping member is forced against the lower clamping member, thus clamping the diaphragm between them. The central portion of the upper clamping member is formed as the insulated electrode. The lower surface of the upper clamping member is lapped flat. Thus the peripheral edge of the diaphragm is clamped with an even pressure all around, because the spherical surface of the lower clamping member adjusts itself in the conical bottom so that its upper clamping surface

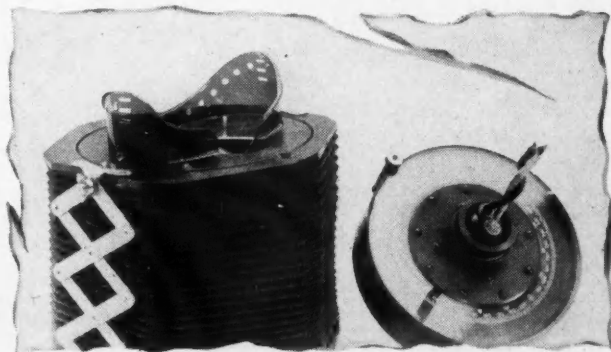


Fig. 6—Sweep unit and accordion-type viewing hood
(U. S. Pat. 2392581)

is parallel with the surface of the upper clamping member, even if the latter have a slant with reference to the pickup axis. Furthermore, during the clamping operation no twisting, turning or rubbing action will be exerted on the diaphragm because the three parts, lower clamping member, diaphragm, and upper clamping member, will turn together as one unit with reference to the body. The heat flow will take the path mainly through the pickup body to the fins from where it is dissipated into the atmosphere, and only a comparatively small portion of the heat will pass through the diaphragm, from which it is effectively removed through the cooler upper clamping member. From a fatigue point of view it is advantageous that the diaphragm will be deflected from its unstressed form always in one direction, that is downwards, and no stress reversal takes place.

Diaphragms are stamped out of steel or of beryllium bronze strip material; both materials have been found satisfactory, but the latter is preferable on account of its longer useful life. Silver plating the diaphragms for better conduction of electricity has been tried, but found unnecessary. The insulated terminal is designed on the lines of an engine spark plug.

SWEEP UNIT—The sweep unit has been built in several forms, with one or more neon lamps, and with one or more light conductor arms, to suit one-cylinder and also multi-cylindere engines. The construction found most generally usable is the one-neon lamp, one-light conductor arm type, as shown in Fig. 6. The internal construction conforms approximately to Fig. 1. The dial face is 6.0 in. diam and the circle of lighted arc is 5.0 in. diam. The dial face is of Lucite on which the gradations are marked in luminous paint so as to facilitate reading the degrees in subdued light. The dial face is rotatable, so as to facilitate the initial setting, when the engine is brought into its dead center phase, and the zero marking of the dial is made to coincide with the peripheral end of the light conductor

arm. The neon lamp is mounted in the center and it is easily removable for inspection, even during an experiment, without stopping the rotor.

The rotor is driven in existing installations usually directly from the crankshaft. But any type of positive drive, such as by bevel gearing, or chain drive can be used. In view of the negligible torque necessary for the drive flexible shaft also appears usable.

The lighted arcs produced by the neon lamp are fairly well visible in subdued light. For increasing the visibility of the lighted arcs, an accordion type viewer has been found useful, such as the one shown in Fig. 6.

ACCESSORY ELEMENTS—The manifold is connected to the pickups with insulated tubing of small diameter (about 1/16 in. ID) through regular flared type, Ermeto-type, or Banjo-type pipe connectors. In previous indicators of this type usually a non-insulated tubing was used as conduit for the pressure-measuring medium, and a separate electric wire for the electric connection. The insulated tubing, combining the two functions, has the advantage of simplifying the installation. It does not clutter up the engine, which is quite important, especially in installations on multi-cylindere engines.

The source of electricity is 120 v d-c which may be taken from either an available power source, or from a radio B-battery. In view of the small current consumption of the neon lamp (0.030 amp) the useful life of the battery is long.

TEST RESULTS—The pressure-duration indicator has been tested on several types of engines, running at speeds up to 2500 rpm. The apparatus performed in the intended manner. The engine speed was found to be no limiting factor. In some tests the pickups were exposed to the engine pressure for several hours, without failure of the diaphragm. The air cooling provided by the fins was found sufficient and satisfactory. An installation on a GM Diesel engine is shown in Figs. 7A and 7B.

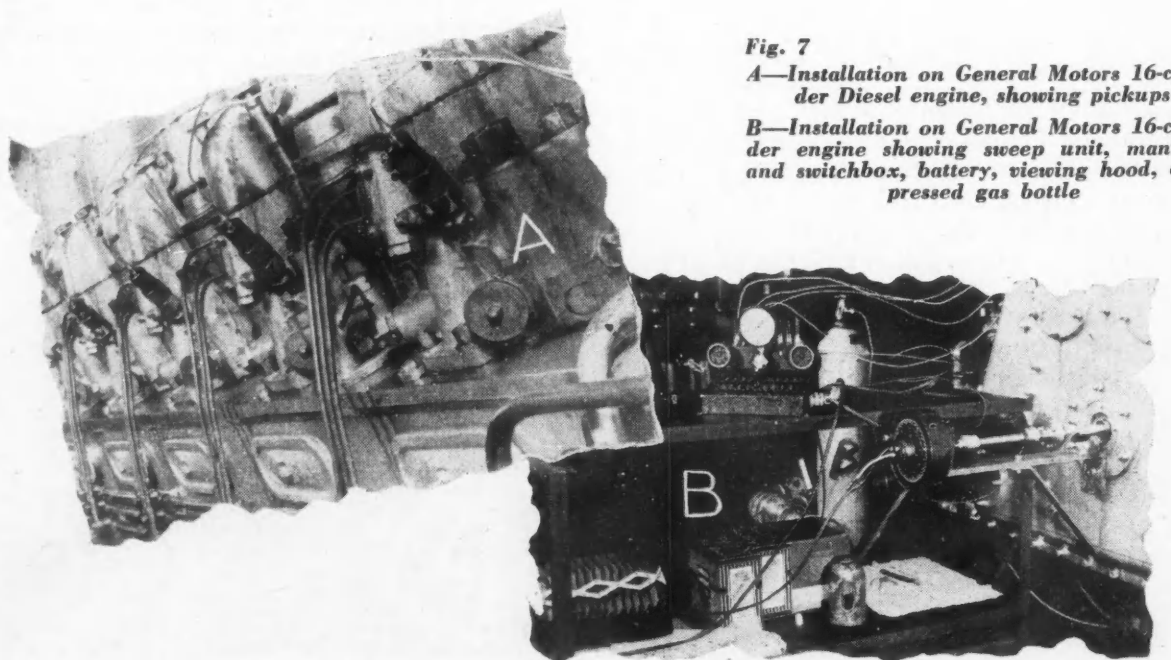


Fig. 7

A—Installation on General Motors 16-cylinder Diesel engine, showing pickups

B—Installation on General Motors 16-cylinder engine showing sweep unit, manifold and switchbox, battery, viewing hood, compressed gas bottle

Conclusions

Whether or not this instrument will be used as regular equipment on engines in normal use, only accumulated experience on large numbers of engines will decide. The author, however, feels confident in expressing the following opinions: The pressure-duration indicator, at its present stage of development, can be used for development and research testing on en-

gines, and provide more complete information more conveniently and at higher reliability than obtainable by other methods and instruments. Should it be felt that the instrument, in its present form, is not yet fully adapted for routine testing of engines in regular use, it forms nevertheless a promising basis for further simplification and development for that purpose.

BIBLIOGRAPHY

1. Floyd B. Newell. Indicator. U. S. Pat. 1,692,513. November 20, 1928. Application filed May 3, 1920.
2. Dickinson, H. C. and Newell, F. B. A High-Speed Engine Pressure Indicator of the Balance Diaphragm Type. N.A. C.A. T.R. 107. 1921.
3. Wood, M. R.A.E. Electrical Indicator. Engineering (London) Vol. 115. January 26, 1923.
4. Flight Tests with R.A.E. Electrical Indicator. R.A.E. Report and Memorandum No. 880. 1923.
5. Ricardo, H. R. Combustion in Diesel Engines. J.I. Inst. Aut. Engineers. (London) March, 1930.
6. Brandt and Viehmann. Der D.V.L. Glimmlampen-Indikator fuer schnelllaufende Maschinen. Bul. 322. German Research Institute for Aeronautics. Automobiltechnische Zeitschrift. Vol. 36. June 23, 1933.
7. Der D.V.L. Mehrzylinder-Glimmlampen Indikator. Luftfahrtforschung. Berlin. No. 10. 1936.
8. Collins, J. H. Alterations and Tests on the Farnborough Engine Indicator. N.A. C.A., T.N. 348. 1930.
9. Hemmeter, G. T. New Recording Method for Electric Engine Indicator Gives Positive Card Directly. Automotive Industries. February 9, 1935.
10. Schlesman, C. H. Engine Indicator. U. S. Pat. 2,085,203. June 29, 1937. Describes a balanced pressure indicator with cathode-ray oscillograph, as indicating element.
11. Reynolds, B., Schecter, H., and Taylor, E. S. The Charging Process in a High-Speed, Single-Cylinder, Four-Stroke Engine. N.A.C.A., T.N. 675. 1939.
12. Caldwell, F. G. and Flock, E. F. Comparison of Diaphragms for Balanced-Pressure Indicators. Automotive Industries. January 15, 1941.
13. Grinstead, C. E., Frawley, R. N., Chapman, F. W., Schultz, H. F. An Improved Indicator for Measuring Static and Dynamic Pressure. Transactions SAE, Vol. 52, No. 11. November, 1944. Describes a condenser-type electronic indicator, and also balancing pressure elements, diaphragm-type, for both high and low pressure, for calibrating the condenser-type indicator.
14. DeJuhasz, K. J. The Engine Indicator. Instruments Publishing Co., Pittsburgh, Pa. 1934. Describes several types of balanced pressure indicators. Chapter X deals with errors due to the inertia of pressure-responsive members.
15. DeJuhasz, K. J. Der Indikator. Julius Springer, Publisher, Berlin, 1938. An enlarged edition of Reference 14.

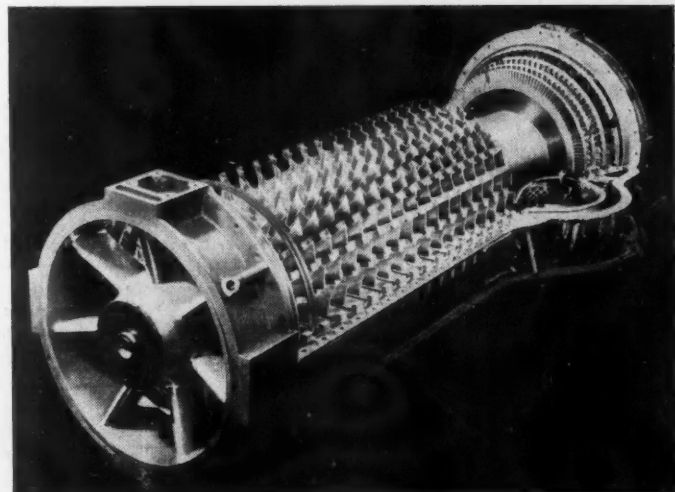
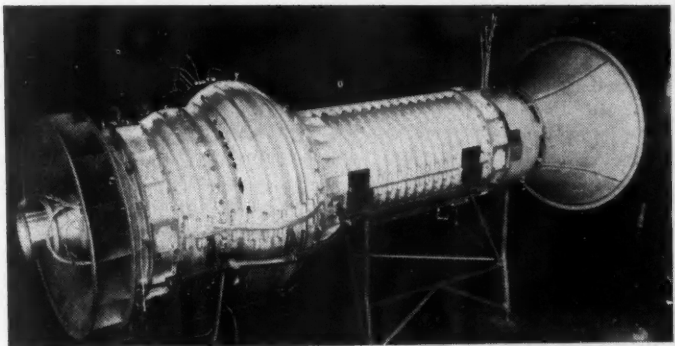
New Gas Turbine Studied for Use in Locomotive

A POSSIBLE use for the new Turbodyne, a gas turbine developed by the Northrop-Hendry Co. for the B-35 Flying Wing, is seen in high-speed locomotives and other commercial applications such as ships and heavy trucks where great power is needed in limited space. A project currently underway at the Northrop-Hendry Co. jointly owned by Northrop Aircraft, Inc., and the Joshua Hendry Iron Works, is concerned with the locomotive application of the Turbodyne engine, using for experimental purposes a Diesel-electric locomotive chassis supplied by the Union Pacific Railroad. Research engineers, under the direction of Arthur J. Phelan who formerly headed the engine research division of Chrysler Motors, hope to reduce the nozzle temperature of the Turbodyne about 150 degrees to 1250 F and effect a reduction in the rpm in order to increase the life of the engine from 500 to 10,000 hr. Thus it is believed the turbine could offset lower fuel costs of the Diesel by an inherently less troublesome operation.

This turbine development was started in 1939 and in 1941 was continued under a joint Army-Navy contract calling for the building and testing of experimental models.

(Top, Right) Shown here is the Northrop-Hendry Turbodyne gas-turbine for aircraft. Air intake is located at the right. Ribbed construction of the shell is claimed to give greater strength with lighter weight. Tubes protruding up are pressure tubes and temperature indicators for checking the engine under test runs

(Right) Inner details of the Turbodyne are visible in this view with the top half of the engine removed. The axial flow compressor has about 1000 blades and the compression ratio is approximately 7 to 1. The turbine wheel at the far end is the multi-stage type. Ahead of it is the annular combustion chamber, the combustion efficiency being reported as between 94 and 96 per cent

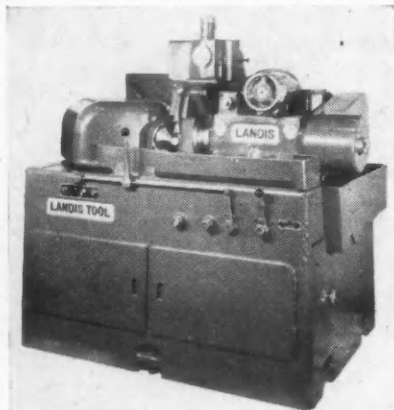


NEW Production and Plant EQUIPMENT

Grinder for Automotive And Airplane Valves

The Landis Tool Company, Waynesboro, Pa., announces a completely new Type H valve grinder. Automotive and airplane valves are said to be ground to an exact seating surface with low operator fatigue factor.

The machine handles valves with face angles 0 to 62½ deg and face diameters of 7/16 in. to 3½ in. The Microsphere bearing headstock uses collets or V-blocks for chucking, and clamps hydraulically. Loading and unloading may be done with the headstock spindle rotating or it may be cycled to stop



Landis Tool H Type valve grinder

when grinding is completed. The headstock is mounted on a fixed table which provides support for the full swiveling range. The wheel spindle also is mounted in Microsphere bearings. Reciprocating movement is adjustable from 0 to ½ in. Standard wheel size is 20 in. by 1 in. by 8 in. Wheel drive motor is 3 hp.

The hydraulic oil reservoir contains 32 gal and the coolant reservoir 42 gal. The machine weight is 8700 lb.

Heavy-Duty Buffer

A new heavy-duty overhang buffer, especially adapted to long and deep work requiring maximum clearance, is now in production by the Bradford Machine Tool Co., Cincinnati 4, Ohio.

Known as Model "660," the buffer is belt driven by a ball-bearing motor. The motor platform is adjustable for belt tension. Design permits drive belts to be changed without removing housing from shaft. The buffer is equipped



Bradford buffer

with positive shaft lock, magnetic starter, overload protection, and under voltage release.

This model is produced in power range from 3 to 20 hp. Its speed is 2400 rpm, or to specifications. The motor is 220-440, or 550 volt, 2 or 3 phase, 50 or 60 cycles.

Oakite Offers New Steam Cleaning Unit

The new, improved, Oakite vapor steam cleaning unit, for use in cleaning and paint-stripping a wide variety of industrial equipment and plant facilities, is now available for immediate delivery, according to Oakite Products, Inc., 128A Thames St., New York 6, N. Y.

The unit, an enclosed-coil type, down-draft flame steam generator, delivers a hot vaporized spray in either wet or dry state under pressures up to 200 lb. It generates sufficient steam-cleaning pressure to operate two steam guns simultaneously. The improved model is said to incorporate simplified grouping of gauges and controls, redesigned piping systems, plus a compressed-air valve

Improved Oakite vapor steam cleaning unit. This new model incorporates a number of engineering and design refinements which enhance ease of operation and maintenance

accessory for two-minute anti-freezing of the entire water-steam system. The 12-gal capacity of the fuel tank provides ample steam generation for an uninterrupted eight-hour, two-gun cleaning cycle. After initial throttle setting, unit operation is completely automatic.

The unit is available as a stationary model, mounted on shop-wheel chassis for around-the-plant portability, or mounted on a trailer-type chassis for use at locations away from shop or plant. A ¾-hp, 60-cycle, 110-220 v. a-c motor is mounted on the unit. For special applications, alternate motive power includes a self-contained gasoline engine, where power source is unavailable, or special ¾-hp motors.

Larger Model DoALL Bench Filing Machine

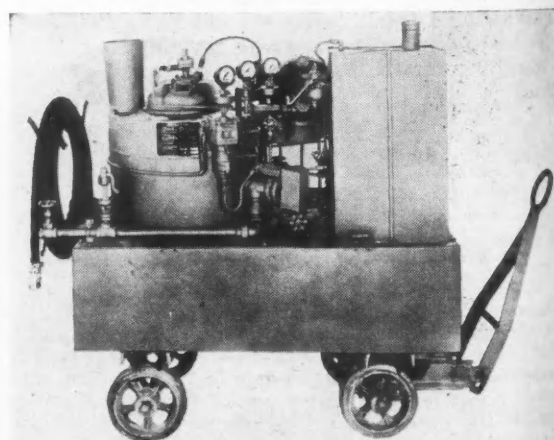
The DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill., is making a new and larger Model FH 10 DoALL precision bench filing machine for filing, sawing and honing operations. This machine incorporates a universal joint clamp which is said to assure a 100



Model FH-10 DoALL filing machine

per cent vertical file position despite warped or twisted file shanks. A file-setting square is supplied for aligning the file, hone, or saw before the universal joint is tightened.

An overarm backup roller gives support to the tool. The tilting table is



10% in. by 10% in. The machine has a 1½-in. stroke and a file shank capacity of ½ in. to ¾ in.

Tools are actuated by a Scotch yoke mechanism running in an oil bath. A window in the housing shows correct oil level at all times. Vertical shaft bearings are adjusted by locking thumb screws on outside of housing.

A neoprene bellows keeps chips out of mechanism and provides an intermittent air jet through a flexible tube to remove chips at point of work.

The unit is powered by a ¼-hp, 110-volt, 1724-rpm, a-c motor which provides approximately 350 strokes per minute. Standard equipment includes files, saw, and honing stone.

Hardinge Multi-Operation Chucking Machine

Hardinge Brothers, Inc., Elmira, N. Y., have designed and built a multi-operation chucking machine to fill the gap between the second operation machine and large turret lathes.

This new Hardinge development is for turning, boring or threading parts up to 6 in. in diameter which have been blanked out on automatic screw machines or turret lathes or for finishing stampings, castings, forgings and many other types of work that ordinarily require many individual set-ups. Typical examples are the many parts requiring threads to be cut concentric with turned or bored diameters, as well as square and true with shoulders on the work. Parts requiring many bored diameters and turned diameters that must be relatively concentric and have a fine finish, can be produced on a rapid production basis on a multi-operation chucking machine. The eight-position turret and the production threading head use

New Production and Plant

EQUIPMENT

standard tools. Also, the precision threading unit is separate, which is equivalent to adding a position to the turret for other tooling.

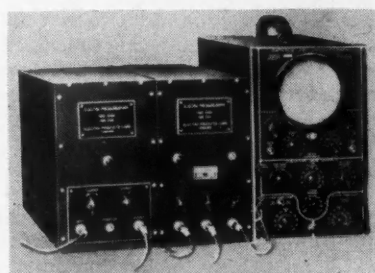
The headstock spindle has a speed range of 150 to 3000 rpm in either the forward or reverse direction. The spindle takes standard 5C collets, providing a 1 in. round collet capacity through the spindle. Step chucks provide collet-like chucking of work up to 6 in. in diameter. Through the use of two, three or four jaw chucks, odd shaped castings, stampings and forgings may be chucked.

The turret has the desirable feature that each station can be adjusted without affecting other turret stations. The adjustable turret station feature is for final adjustment of the cutting tools. The turret takes standard ¾ in. square tool bits or ½ in. by ¾ in. rectangular tools directly on the hardened and ground steel top surface. Through the use of single, double and triple tool holders, as high as 24 single point tool operations can be performed in one set-up.

The machine is supplied complete with welded pedestal which has a motor compartment in the left side and a tool storage compartment in the right side. The coolant facilities are an integral part of the pedestal base. The coolant pump is individually motorized.

Instrument for Study Of Pressure Actions

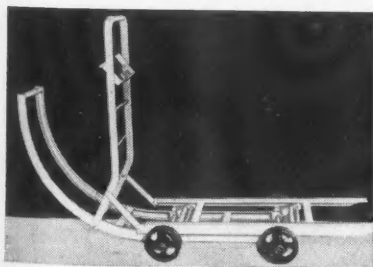
The "Syncro-Marker Pressuregraph," a recent development of Electric Products Laboratories, 549 W. Randolph St., Chicago 6, Ill., reproduces on the screen of a cathode ray oscillograph not only an accurate picture of the pressures in



Syncro-Marker Pressuregraph

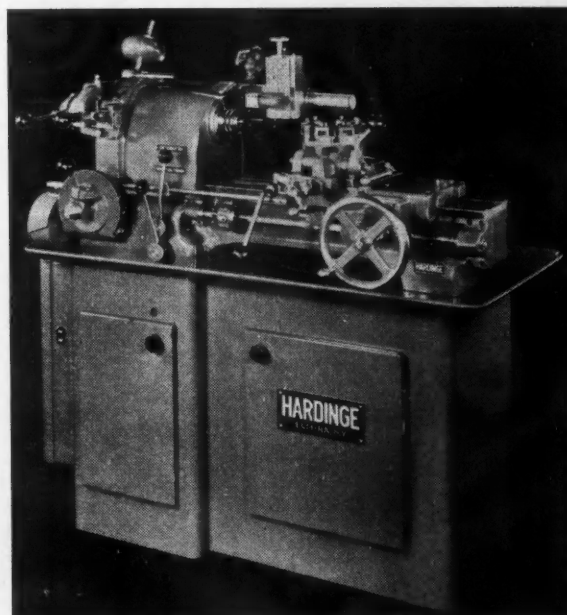
operation during and after the explosion in an internal combustion engine, but relates these pressure variations to definite indicators of time, engine speed, top dead center, etc. This device makes possible accurate studies of the pressure actions of many types of engines, compressors and pumps, as well as jet engines, and permits studies of fuel efficiencies, displacement of moving parts, etc. (Next page, please)

Light Hand-Lift Truck



This light hand-lift truck, made by Arcade Manufacturing Division, Rockwell Manufacturing Co., Freeport, Ill., is said to be particularly adaptable to the moving of skid-loads, boxes and trays of material, and other miscellaneous items up to a ton in weight. With platform lowered, the truck has ample clearance under a skid-box. A pull lifts the load above the wheels, and locks securely

Multi-operation chucking machine made by Hardinge Brothers, Inc., that handles parts up to six in. in diameter

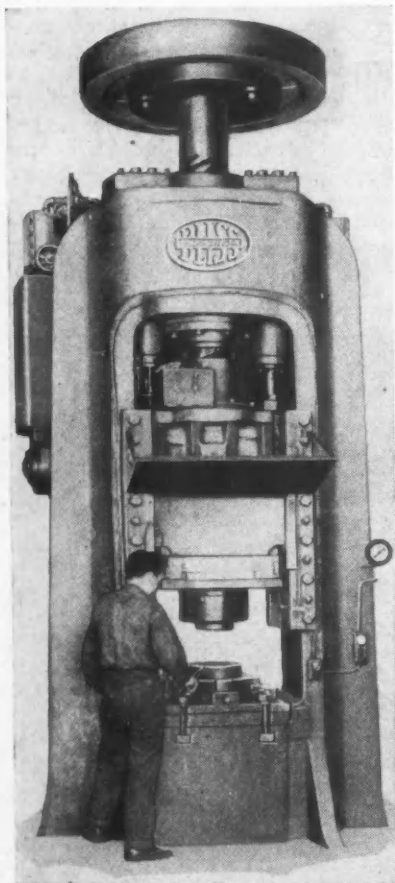


"Transient" pressures are fully revealed and can be studied with the Syncro-Marker which, with an additional system of marker signals, enables the engineer to compute from definite references which are expressed in either 5-deg of angular velocity (engine rotation) or in milliseconds measured by one in. on the oscillograph screen.

New Departures in Percussion Press Design

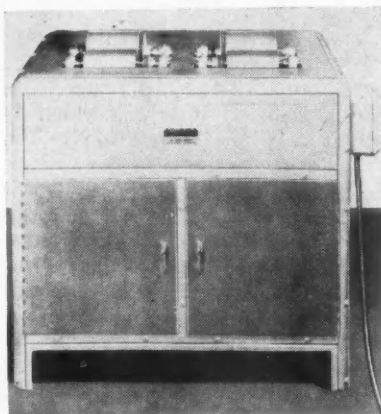
A new departure in percussion press design, which introduces hydraulic pressure for moving the slide and makes possible rapid production of hot forgings, steel, brass, aluminum in a wide range of shapes, has been developed by the E. W. Bliss Co., Detroit 2, Mich.

The operating principle of this 600-ton Hydro-Screw press employs a flywheel at the top of the screw which is brought up to speed by hydraulic pressure and utilizes the accumulated energy developed to deliver a quick, hammer-like blow, uniform in power. On a 16 in. stroke under maximum power, the machine cycle is completed



New Bliss 600-ton Hydro-Screw press

Rough and Finish Lapping On Same Machine



Size Control Co., Division of American Gage & Machine Co., 2500 Washington Blvd., Chicago 12, Ill., has added this two-stage lapping machine to its line of centerless lapping equipment. The roll at the left is for rough lapping and the other is for finishing. The maker states that lapping time is greatly reduced, and a precision finish of two micro in. is easily obtainable

within three seconds from start to return. In many cases only a single blow is required to finish a part.

Power is adjustable and can be reduced by regulating the delivery of the variable delivery pumps. Continuous lubrication of the screw is maintained by means of a pump in the slide which provides a constant supply of oil at the top of the nut while the press is in operation.

For immediate reversal at rebound, the quick-action valves reverse the motion of the hydraulic pistons. At the top position, the valves immediately lock the hydraulic pressure, preventing the slide or gate from drifting down.

For die setting, a push button control with selector switch is provided. During inching, the slide can be brought up or down in small increments to enable accurate die setting without danger of injuring the dies.

An air-operated lift-out in the bed and similar knock-out in the slide are controlled by limit switches operated by the slide.

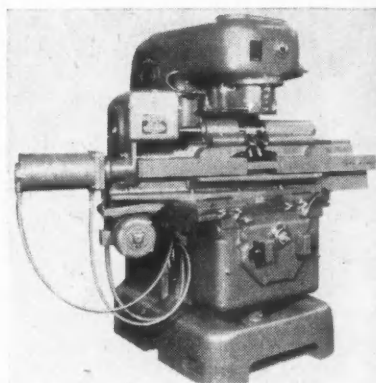
The press is equipped with one 40-hp, 1200-rpm motor and two Vickers PV-2050 pumps. It has an 11-in. diameter, 12-in. lead, 4-thread screw. Flywheel speed is 115 rpm with a kinetic energy of 21,000 ft lb.

This type of press is available in three sizes, 400 tons, 600 tons, and 1000 tons capacity.

New Method of Finishing Electric Motor Rotors

National Broach and Machine Co., 5600 St. Jean, Detroit 13, Mich., is producing a new machine for RotoShaving the laminations of electric motor rotors from the rough in one operation by combining three principles which have been proved in other fields. These are: The use of a fine-pitch, high-precision cylindrical milling cutter operating at high speed; the principle of crossed axes shaving which has revolutionized gear shaving, and the principle of diagonally traversing the work across the cutter in order to spread the cutter wear uniformly over its full face. The net result is said to be accuracy comparable with grinding, a considerable reduction in machining time and no closing of the laminations or burring of the slots.

The new Red Ring Rotor Shaver is built somewhat along the lines of the gear shaving machine. The cutter head is adjustable to provide a wide angular range between work and cutter axes. In addition to this, the table has a 15-deg swing in its horizontal plane to provide the diagonal angle desired. The



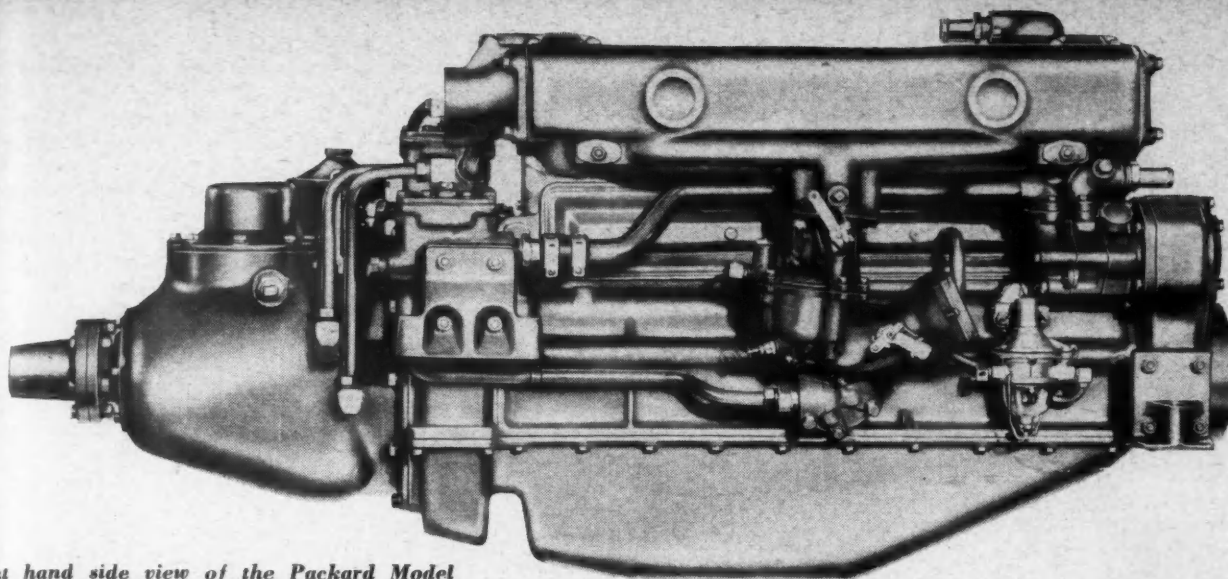
Red Ring Roto Shaver

knee is adjustable vertically for different diameters of work. Table travel, adjustment of head and tailstocks and knee are sufficient to accept rotors having a wide range of shaft lengths, face widths and diameters.

Shake-Out Booth Is Self-Contained Unit

A recent development of Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich., is the Uni-Wash shake-out booth which is a self-contained unit complete with intake hood, air cleansing process and exhaust fan. Available in five standard sizes, these units may be used individually or in combination to collect dust from shake-out, core knock-out, shaker screening, sand transfer, mold conveyor and pouring operations. The manufacturer also claims that the intake suction is sufficient to carry away

(Turn to page 56, please)



Right hand side view of the Packard Model 1M-245, six-cylinder marine engine. Here may be seen the new Zenith 1½ in. carburetor, the AC fuel pump at the right, and directly above it, the positive-driven gear type water pump. The oil heat exchanger for the reverse gear oil system is mounted directly over the rear arm on this side.

New Features in Packard Marine Engines

SUPPLEMENTING a recent brief announcement, the Packard Motor Car Co. is now releasing mechanical details of its two marine engines recommended for pleasure craft as well as work duty. The outstanding feature of both the Six and the Eight is the standard installation of the new Packard hydraulically-operated reverse gear with finger tip control. Reduction gears also are available for installation behind the reverse gear.

Both engines are designed and equipped specifically for marine duty. However, it will be found that they have the same displacement as corresponding engines in Packard passenger cars and use the same connecting rods, pistons and rings, rod and main bearings, crankshaft, torsional vibration dampener, and flywheel.

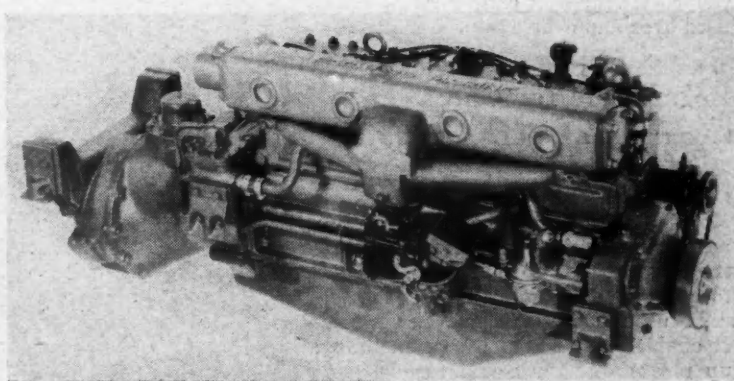
The Model 1M-245, six-cylinder marine engine has the following specifications: L-head 3½ in. bore x 4¼ in. stroke, 245 cu in. displacement, rated 100 hp at 3200 rpm with compression ratio of 7 to 1. The oil pan is of cast iron to provide the necessary corrosion resistance. The crankshaft has four main bearings, is counterbalanced, and fitted with a vibration dampener. Rod and main

bearings are of the steel-backed precision type with a matrix of sintered copper-nickel and an impregnated coating of babbitt.

A new model Zenith up-draft carburetor of 1½ in. size is used. It is light in weight and mounts a flame arrestor. The ac pump is of the automotive diaphragm type. Intake and exhaust manifold are integral and include a heated intake riser and jacketed exhaust header.

Both engines have marine type oil heat exchanger, full flow oil filter, gear type oil pump driven by the camshaft, and a gear type water pump. The latter is of advanced design with synthetic rubber molded impellers positively driven from the timing gear case. It delivers raw or sea water to the cylinder block, oil heat exchanger, and exhaust manifold.

(Turn to page 86, please)



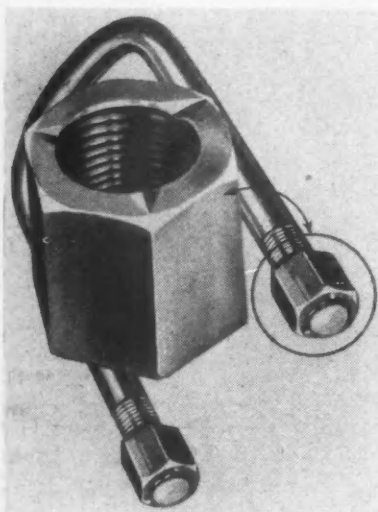
Side view of the Model 1M-356, Packard Eight-cylinder marine engine.

NEW Products

Self-Locking Nut

Gripco hexagon U-bolt Hi-Nuts are an improved type self-locking nut being offered for trailer, truck, bus and car leaf spring fastenings, by the Grip-Nut Co., 311-C S. Michigan Ave., Chicago.

The new U-Bolt nuts are specially designed to meet the service conditions encountered on vehicle leaf spring fastenings. No cotter pins or washers are required.

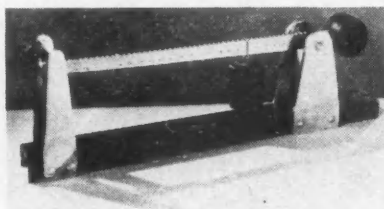


Gripco nut and U-bolt

A triangular deflection of the upper thread of this nut provides a friction locking action on the bolt threads. The Gripco U-Nut Bolt can be removed and used over and over again.

Beam Scale for Checking Accuracy of Torque Tools

Airdraulics Engineering, Inc., New Canaan, Conn., announces the new Model SDB-25 beam scale. This torque measuring device is used for checking the accuracy of torque screw drivers, torque wrenches and other torque tools, and is used to test and adjust power tools. It enables manufacturing plants to set up torque standards and torque specifications on all fastenings. The Model SDB-225 beam scale is said to be accurate to a fraction of a lb-in. with a



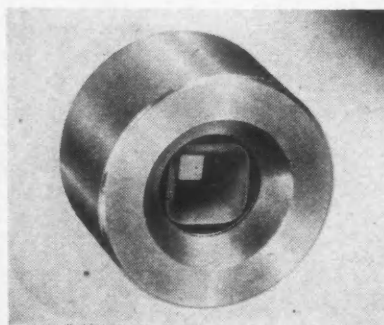
Model SDB-25 beam scale

standard capacity of up to 25 lb-in. This capacity can be made to vary by increasing or decreasing the regulating weight. Various adapters are made to suit special applications, and larger capacity measuring devices can be supplied to order.

Improved Carboloy Dies

To allow greater latitude in the angle at which stock may enter the dies; to permit faster die finishing and servicing; and to provide more lubrication of both dies and stock, Carboloy Co., Inc., 11151 E. 8 Mile Ave., Detroit, Mich., is making a new line of standard square and hexagonal shape dies that have larger bell openings than previously. The dies are so designed that they may be finished to cover a range in hole sizes from 5/32 in. to 1 1/8 in. for the square dies and from 5/32 in. to 1 1/8 in. for the hexagonal dies.

The enlarged bell opening in the new dies permits the stock to enter the die carrying an even heavier coating of lubricant than was possible with previous dies. The enlarged bell also reduces the amount of extraneous stock which must be removed from the entering angles of the die when making up a finished die from the rough shaped die.



Carboloy Series D square die

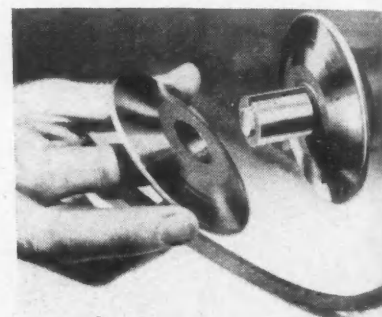
In addition, the design of the new dies allows readier access to the internal die contours which adds to the ease and quickness with which the dies may be finished and serviced. However, both finishing and maintenance is performed in the same manner and with the same equipment as for the previous dies.

The new dies are known as Series "D," and replace the former "R" line of Carboloy shape dies.

Variable-Pitch Pulley For V-Belts

A fixed-adjustable, variable-pitch V-belt pulley is now being manufactured by Scientiae Corp., 103 Pine St., Dayton 2, Ohio.

The new pulley locks onto the shaft with which it is used by means of a spiral wedging action. No set screws are used; no threads or keyways are required on the shaft. The pulley is in rigid alignment when locked on the shaft of an infinite number of adjustments may be easily made. The pulley



Spirallock pulley

will drive in either direction of rotation.

The Spiralok pulley is said to be particularly adapted for use with air conditioning and ventilating equipment, air compressors, conveyors, machine tools, motor-driven pumps and other motor-driven, V-belt connected apparatus of all kinds.

New Material Prepares Aluminum for Painting

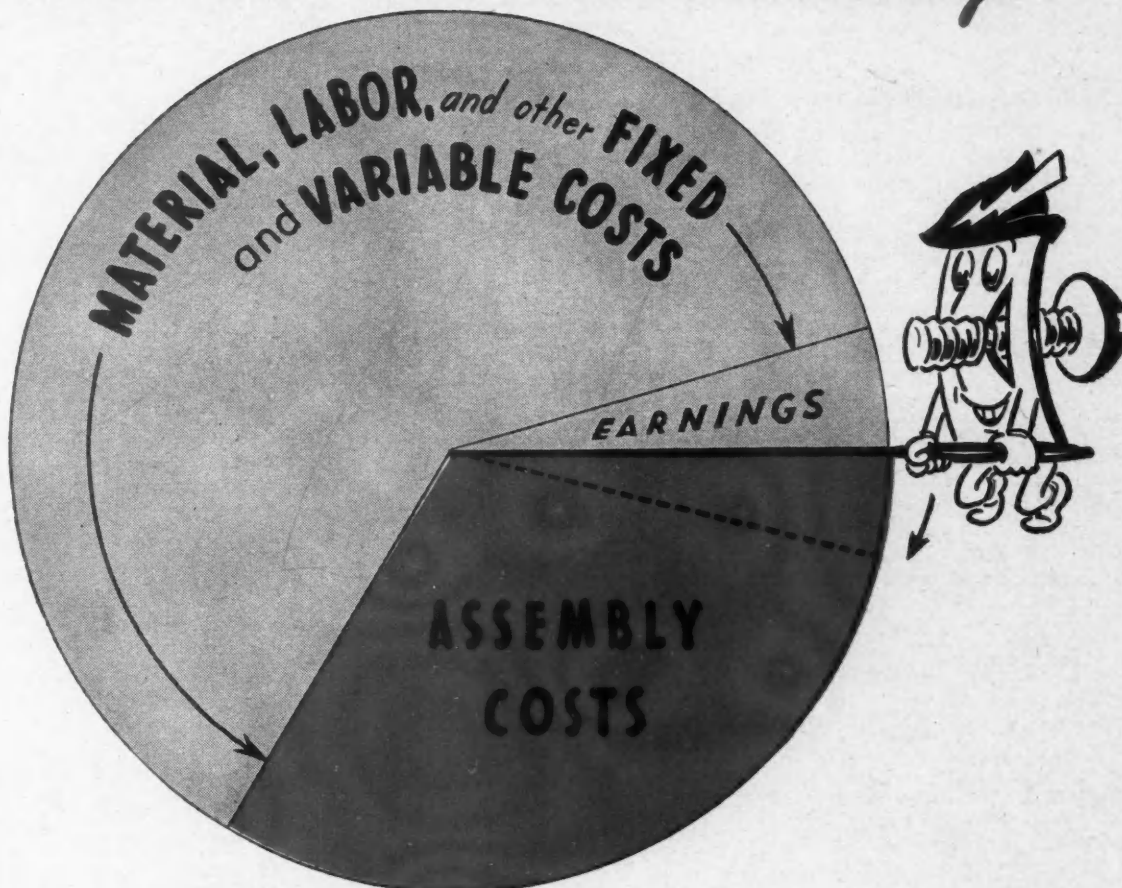
A new material, "Prepaint," has been developed by Colonial Alloys Co., Ridge Ave. and Crawford St., Philadelphia 29, Pa., for applying to aluminum and its alloys which are to be painted or lacquered in high production. No special equipment is required, and existing factory flow-lines are generally not disturbed.

Features of this material are: It is applied at room temperature by dip, spray or brush; it reacts chemically and bonds with the aluminum surfaces in from 15 to 60 seconds in a single chemical treatment; it is kept in an ordinary steel tank or container without piping, valves or controls; it requires no heat or venting; and it is stable, non-flam-

(Turn to page 52, please)

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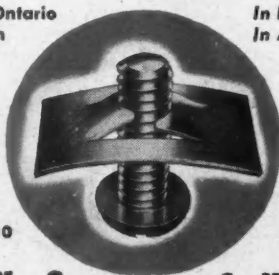
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New Refractory Cement

A new air setting refractory cement, called Armstrong's Air Set, that combines all the essential engineering requirements with the maximum of practical workability required by the brick mason is being marketed by the Armstrong Cork Co., Lancaster, Pa.

The new cold setting cement is designed for use as a bonding mortar with fire brick and insulating fire brick. It is also recommended by the manufacturer as a protective facing for fire brick or insulating fire brick furnace linings.

One of the features of Air Set is its maximum workability. It has high plasticity and can be trowelled directly from the drum after many months of storage. It also pours readily from the drum and is easy to thin with water to dip joint or facing consistency. In the mortar box, Air Set remains in suspension even when thinned, and one mixing is said to provide a uniform consistency of mortar.

Small Scale Models of Handling Equipment

Visual Production Planning, Inc., 5132 Butler St., Pittsburgh 1, Pa., has just produced a complete line of materials-handling equipment, built to 1/4-in. scale.

These planning models consist of

New Prest-O-Lite Battery



Latest addition to the line of the Prest-O-Lite Battery Co., Indianapolis, Ind., is this Hi-Level battery. It is said to require but three fillings during a year of normal use

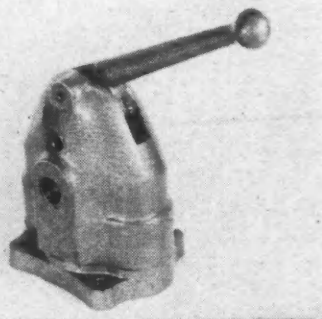
various types of belt and roller conveyors, rack conveyors, transport, motorized and hand trucks, shelving, bins, tote boxes of all sizes; as well as pallets, skids and skid boxes in most standard dimensions.

This materials-handling equipment is to be used in conjunction with the company's three-dimensional template-base machine tool models, which are being used by plant and process engineers.

Balanced-Piston Valves

Lindberg Engineering Co., 2444 W. Hubbard St., Chicago, has brought out a new line of hand operated air valves, utilizing the balanced piston principal. Pistons are held in position by air pressure. Linkage or mechanical connections between pistons and operating lever are eliminated.

Made of cast alloy aluminum, this three-position lever, four-way valve is completely streamlined. It is designed



Lindberg hand operated air valve

for 175 lb maximum working pressure, and all inner parts are made of stainless steel and bronze.

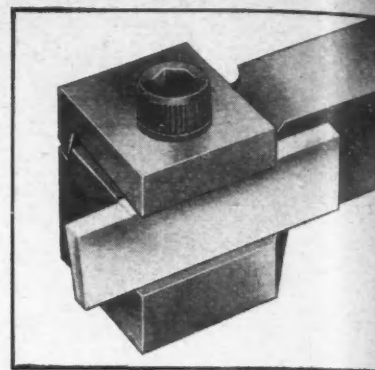
The three-position lever (forward—neutral—reverse) permits easy cylinder control by "inching" as it is possible to stop the cylinder at any given point along the stroke by placing operating lever in neutral position.

Tool for Grooving And Cutting Off

Kennametal Inc., Latrobe, Pa., has placed on the market a new line of tools having clamped-in Kennametal blades, for single grooving or cutting off operations, such as are done on turret lathes.

These tools—designated as Style RG (right hand), and Style LG (left hand)—utilize specially formed blades of the same compositions as in the solid Kennametal blades used on multiple set-ups such as piston grooving of light alloys, bronze, and cast iron.

Each RG and LG tool comprises an advanceable Kennametal blade securely clamped in position in a heat-treated steel holder. The clamping arrangement is such that the blade can be ex-



Grooving and cut-off tool with solid Kennametal blade

tended after resharpening, until about half its length has been utilized.

The Kennametal blade in standard Style RG and LG tools is ground for normal grooving operations, i.e., with zero side rake and zero cutting edge angle. The latter may be reground to the usual 5 deg for cutting-off operations.

Barium Steel Forms Tractor Subsidiary

The Barium Steel Corp. announced the formation of a new subsidiary, the American Steel Tractor Corp., which has been formed for the purpose of developing and producing an all-steel tractor. Engineering designs have been completed and prototypes are being produced at Canton, O., under an order from a European government.

New High-Strength Corrosion-Proof Alloy

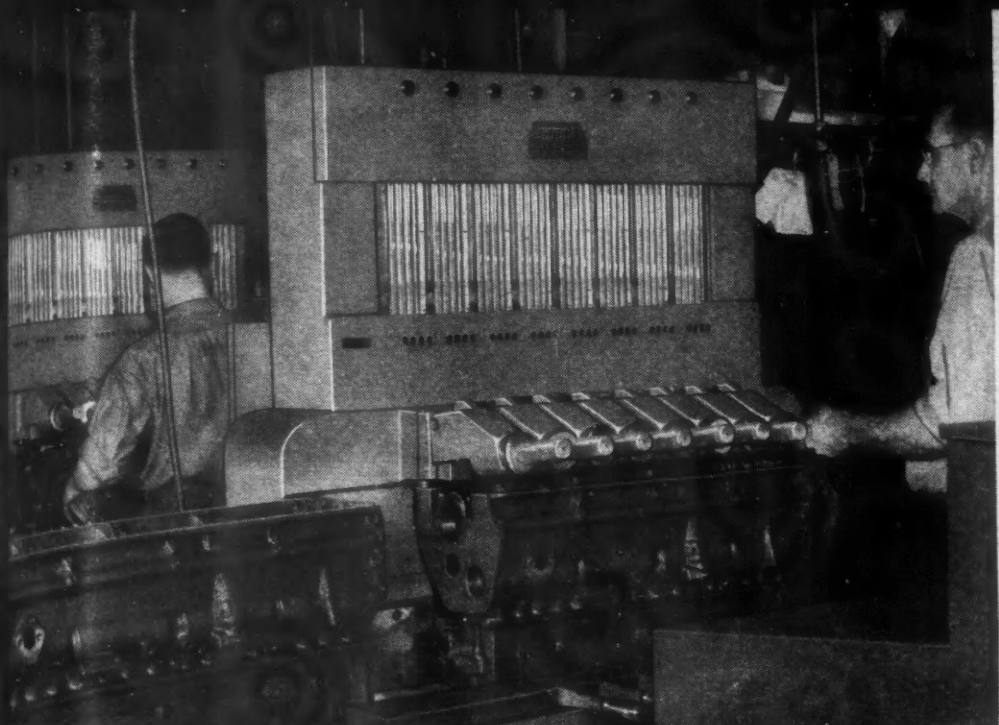
The production of a new alloy mainspring for watches has been disclosed by the Elgin National Watch Co., Elgin, Ill.

The new alloy, known as Elgiloy, is expected to have possible applications in dozens of industries, including the manufacture of stainless cutlery, gun springs, jet propulsion and gas turbine parts, valve parts, chemical equipment, automotive valve springs and parts, electronics, and others.

The outstanding properties claimed for the durapower mainspring include: Its 100 per cent resistance to rust; excellent resistance to all ordinary chemicals; ability to function without setting; ability to deliver constant power over long periods of time; non-magnetic properties; improved brace assembly; and superior physical qualities.

Advertising Notes

R. H. Crooker, vice-president of Campbell-Ewald Co., has resigned to establish the Beach Chevrolet Co., a Chevrolet dealership in Long Beach, Cal.



At Left: Sheffield Precisionaire Gaging Machine simultaneously checking 32 points of inspection.

This is one of a series of applications pointing out the many advantages of Vickers Hydraulic Controls.

Below: Vickers Hydraulic Power Unit installed in base of Sheffield Precisionaire Gaging Machine.

COMPLEX MOTIONS

of this AMAZING GAGING MACHINE

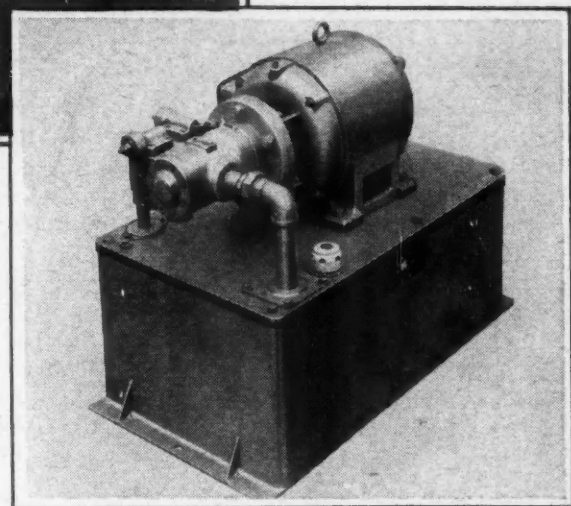
MADE *SIMPLE* BY

VICKERS HYDRAULIC PUMPS AND CONTROLS



Sheffield Precisionaire Gaging Machine simultaneously measures the diameter at four points in each of 8 cylinders in a motor block—32 points in all. Each bore is then stamped with its true diameter for selective assembly. At the rate of 50 blocks or more per hour, the savings made by this machine have been spectacular.

The machine must make a complex series of motions on each block: (1) ram pushes block into position, (2) two rams from behind push block against stop for accurate transverse location, (3) plunger from above engages hole for accurate longitudinal location, (4) gaging plungers come up simultaneously—one for each cylinder, and (5) withdraw



gaging plungers and locating plunger, then return ram.

One push button puts motions No. 1, 2 and 3 (above) into automatic operation; another push button actuates motion No. 4 while a third actuates motion No. 5. To get them all into limited space with proper sequential timing by any other means would have been a difficult problem for the designer. But Vickers Hydraulic Equipment simplified the job. Hydraulic pressure is supplied by a Vickers Power Unit which consists of motor, tank, pump and relief valve all in one compact assembly ready to connect to the hydraulic circuit.

The Vickers Application Engineer nearest you can undoubtedly show you highly satisfactory hydraulic solutions to machine control problems similar to your own.

VICKERS Incorporated

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • SEATTLE • TULSA • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

British Look for

New Tax System

to Boost Car Exports

CONVINCED that the present system of automobile taxation is a handicap in the struggle for export markets, British automobile manufacturers and car owners are now giving active support to the long-discussed scheme of incorporating almost all taxes in the selling price of gasoline. Recently the Royal Automobile Club, the Automobile Association and the Royal Scottish Automobile Association, who can be said to represent practically the entire body of car owners, petitioned Chancellor of the Exchequer Dalton to incorporate this system of taxation in the forthcoming budget. The Government is not opposed to the scheme, providing there is no reduction in the total amount received from this source.

The proposal is not new, but has not been adopted because of a lack of agreement among the interested parties. At present only a section of truckers appears to be apposed to it, but they can find relief by the use of Diesel engines, for it is probable that gasoline and heavy oil will be taxed at different rates. The probabilities are that the scheme, if adopted, would take the effect of a registration fee of about \$20 and an additional tax on gasoline of 4 to 6 cents per American gallon, which would give a retail selling price of about 36 cents per American gallon.

The taxation scheme, which went into effect on Jan. 1 of this year for all new cars, is at the rate of 30 shillings per 100 cc (approximately one dollar per cu in.). This replaces the old RAC formula of 30 shillings (six dollars) per RAC hp but in its practical application it results in no real change.

For a number of years British manufacturers nourished the theory that their horsepower taxation scheme gave them protection against American competition on their home market. All American cars came into the 20 hp class or upwards, the Ford V-8 being rated at 32.6 hp, Packard at 33.8 and Cadillac at practically 40 hp. No American car approached the 7, 8, and 9 hp rating of Austin, Morris and British-built Ford thus creating a monopoly in these classes for the home makers. Gradually the truth became apparent that these tax dodging cars are unsuited for any but home conditions, where road surfaces are excellent and the radius of action is limited. The atten-

tion of the buyer has been focused on the annual horsepower tax, with the result that manufacturers have built engines to artificial limits with variations of only one or two official horsepower. Thus the returns for last year show that the greatest production in 1946 was in cars of over 8 but not exceeding 12 hp, followed very closely by cars not exceeding 8 hp. The number of cars exceeding 20 hp was only 1140 for the home market and practically the same number for export.

Now that the emphasis is on export, manufacturers are asked to be freed from a restriction obliging them to build down to a very limited piston displacement. The British public does not buy small cars because they are cramped, but because they represent the smallest overhead. They would prefer bigger cars if they cost no more to operate; and by removing the displacement tax such cars could be built, enabling the Britisher to compete overseas on more equitable terms with American firms. This has just been voiced in the

House of Lords by Lord Lucas of Chilworth, representing the automobile industry, who was supported by several other members. Designed primarily for the export market, two new cars were introduced by Austin at the Geneva automobile show in March. Their main differences are in body styling and engine horsepower, one having a 110 hp engine and the other a 120 hp engine. Design details are given in the News of the Industry section in this issue.

The pay-as-you-go system of taxation is not new. It was adopted by France about 15 years ago with very satisfactory results. While giving designers greater freedom, it gave impetus to the used car industry, putting automobiles into the hands of people who would not have purchased had there been a standing overhead; and it encouraged the possession of more than one car per family. An incidental advantage was that the pay-as-you-go tax cost practically little to collect compared with the horsepower system.

The slowing down of production by reason of the present coal crisis has strengthened the position of tax reformers. If the change comes—and it is very probable—it will make little if any immediate difference to the home market. At present manufacturers are inclined to take a pessimistic view on production.

(Turn to page 88, please)

By W. F. Bradley,

European Correspondent of
AUTOMOTIVE and AVIATION INDUSTRIES

The CONE AUTOMATIC MACHINE COMPANY



sees many

GOOD THINGS AHEAD

It is reported that

Ralph C. Coxhead Corp. of New York has a new Vari-Typer that uses 600 styles and sizes of type, plus foreign language, chemical, mathematical and other symbols.

get ready with CONE for tomorrow

Patent 2,409,181 covers a sectional motor truck that can be separated into three pieces and carried anywhere by air.

be ready with CONE for today

Stromberg-Carlson has a new inexpensive adaptor that will enable most owners of pre-war FM sets to receive broadcasts on the new band.

get ready with CONE for tomorrow

Frigidaire, Division of General Motors, is making a plastic lid for its ice cream cabinets that is claimed to be 50% lighter than steel.

be ready with CONE for today

New England Carbide Tool Co. is taking tungsten carbide to the housewife in its new precision knife sharpener.

get ready with CONE for tomorrow

The State of Minnesota will go into business with Continental Machines, Inc. to engage in a continuous chemical process for the extraction of pure iron from slate formerly wasted at the Mesabi iron range.

be ready with CONE for today

The New Holland Machine Co. of New Holland, Pa., will test its new flame cultivator on truck and garden crops in the Rio Grande Valley this winter.

get ready with CONE for tomorrow

Bell System's first experimental rural radio-telephone circuit connects 8 Colorado farms with the Cheyenne Wells central office. Wind driven generators supply power.

The four largest alternating current motors ever built, 65,000 horsepower each, will be made by Westinghouse for Grand Coulee.

be ready with CONE for today

Lockheed's Little Dipper light plane is reported to cruise at 100 m.p.h. and land at 20.

get ready with CONE for tomorrow

A mobile alcohol plant built into a five car train that could travel from farm to farm was demonstrated at the National Chemical Exposition.

be ready with CONE for today

Phthalic anhydride, one of the most important ingredients in the manufacture of paints, is now being made from petroleum by Oronite Chemical Company.

Climax Molybdenum Corp. is working on two new high temperature alloys. One has 60% chromium, 25% molybdenum and 15% iron. The other has 60% chromium, 15% molybdenum and 25% iron.

get ready with CONE for tomorrow

The Gyro-Glider developed at the General Electric Flight Test Center has a rotor instead of wings and weighs 120 pounds, ready to fly.

be ready with CONE for today

M. W. Kellogg Co. has a new process for separating a considerable number of useful substances from fish and vegetable oils using liquefied propane at high pressure.

get ready with CONE for tomorrow

The Texas Company's new cold weather aircraft fuel is claimed to start an engine and to permit switching to regular aircraft gasoline in two minutes, in spite of extremely low temperatures.

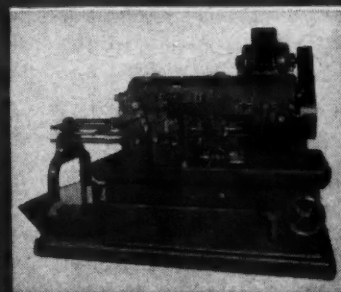
FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION



MORE facility is MORE value

The $\frac{3}{8}$ " 4-Spindle Conomatic, ordinarily assigned to rugged jobs, produced the brass pieces shown in 6 seconds each, including tapping.

Ask your CONE representative to show you our new color motion picture



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

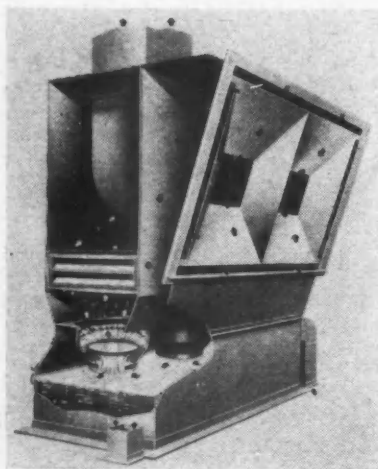
38

(Continued from page 48)

much of the fumes from such operations.

The Uni-Wash shake-out booth is delivered completely pre-assembled, ready to bolt to the floor. Connection of the water and electrical services and the discharge ducts are the only installation operations necessary.

Air is drawn into the booth and down the duct in the front to the Uni-Wash process. It is given a multiple wash as



Cut-away view of Uni-Wash shake-out booth

it passes through the Uni-Wash and then goes through moisture separators. From here it is distributed by the built-in discharge fan.

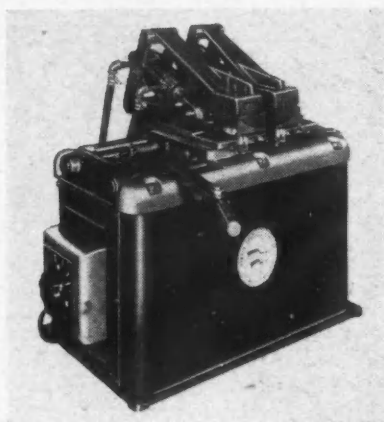
The dirt from the air is collected in the form of wet sludge in the water tank in the bottom of the booth. An automatic sludge conveyor carries the sludge to the discharge point. This feature reduces maintenance to periodic clean-out of the tank which can be done through large access doors provided in the rear of the unit.

The fan and motor are direct connected and are the only moving parts of the entire unit. The water is continuously re-circulated by means of fan suction which eliminates spray nozzles.

Bench-Type Butt Welder

Banner Products Co., 4918 N. 29 St., Milwaukee 9, Wis., offers a new bench-type butt welder. The 10 kva model shown is manufactured for either 220 or 440 volt, 60 cycle current.

Features are eight ranges of heat, round steel guides for movable platen in oilite bushings, ample grease outlets and built-in tap switch. Head is of high strength bronze, water cooled, and has good electrical conductivity. Transformer is water cooled with asbestos shield.



Butt welder made by Banner Products Co.

Alignment is said to be assured through the use of a two-in. diameter air block on clamping jobs. The blocks maintain a constant pressure on material being welded.

Operation is started by a covered foot switch connected to a four-way solenoid air valve which brings clamps to position. The movable platen has a left-hand lever with pilot switch connection which closes to apply current at joint, and at the same time the hand lever is pulled toward the stationary platen for upset. Current is automatically shut off by an adjustable limit switch. Air line equipment is included with machine.

Special Model Pallet Truck

Designed to handle reels or similar bulky cylindrical items, this special-model pallet truck is a modified version of the Transporter battery-

powered hand truck manufactured by Automatic Transportation Co., 149 W. 87 St., Chicago 20, Ill.

Forks are engineered and widened to straddle the reel when in lowered position and to lift it from the floor when raised.

Drive unit and operation are identical to those of the standard Transporter, the only modification being the forks. The unit was originally designed according to specifications of a large cable manufacturer, who uses the truck to handle reels of finished cable in his plant.

The truck shown is designed for handling reels of 54 in. diameter and 38 in. wide. Forks are 45 in. wide at the outside, mounted on a standard 4000-lb load capacity Transporter. Specifications may be adapted by special order for any particular size and type of reel.

Automatic Gaging Machine

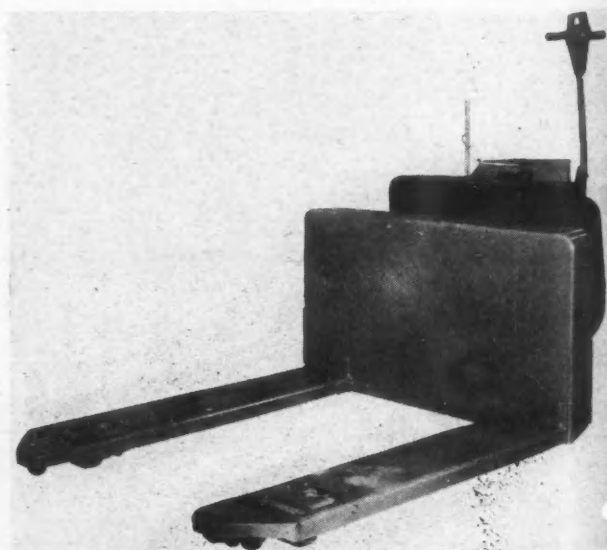
An "Airlectric" automatic gaging machine that checks the average outside diameter of shock absorber pistons and segregates them into eight classes has been brought out by the Sheffield Corp., 721 Springfield Ave., Dayton, Ohio. It will check and classify pistons at the rate of 3600 per hour.

After the pistons are ground on a centerless grinder, they proceed on a conveyor belt to the operator of the machine. He removes them from the conveyor and places the parts in a chute, so designed that it will permit pistons to be entered only in the proper manner. The parts then proceed to the bottom of the chute where they pass under an Electrichek gaging head, which actuates devices that automatically reject any excessively oversize parts. These parts can be salvaged and re-ground.

The remainder of the parts are removed from the Electrichek gaging station and inserted in a tungsten carbide air ring. The air ring is connected to

(Turn to page 58, please)

Modified version of Transporter Truck



POWER



FOR DEPENDABLE DIESEL CRANKING GIVE THE JOB TO EXIDE BATTERIES

When tough, ruggedly-built Exide Batteries do the cranking, Diesel engines start. The great power of these specialized batteries and their ability to discharge at high rates and high voltages, enable them to deliver the extra speed that Diesel cranking requires.

You'll find Exide Batteries on trucks, buses and off-the-highway equipment . . . in ships, railway locomotives

and industrial power plants. And on each job, Exide Batteries are giving dependable cranking performance with long-life, economy and ease of maintenance.

Write today for a FREE copy of the Exide Catalog on Heavy-Duty Batteries. It gives you catalog data and information on how to get the most from your Diesel Cranking Batteries.

Exide

BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

April 1, 1947

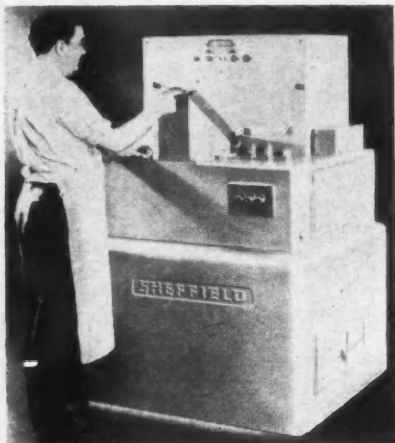
When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

57

New Production and Plant EQUIPMENT

(Continued from page 56)

a series of "Airelectric" gaging heads that determine the size of the part and lights one of the individual signal lights located directly behind the chute. Each of the lights has a prearranged color band around the diffusing lens to indicate the size of the piston. The lights will come on only if the part is within the minimum and maximum tolerance

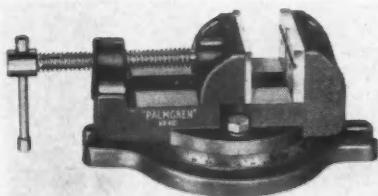


Airelectric automatic gaging machine

limits. This permits the operator of the machine to determine the size of the pistons and informs the operator of the grinder to what range he is grinding the parts.

Pistons are ejected from the air ring and, depending upon size, pass into the corresponding receptacle. Each piston is segregated and classified as to under-size, oversize or one of the five acceptable classifications.

Milling Machine Vise With Swivel Base



Here is a new milling machine vise, just introduced by the Chicago Tool and Engineering Co., 8345 S. Chicago Ave., Chicago 17, Ill. This low-built, compact vise is equipped with a swivel base to afford set-ups at any radius within 360 deg. Known as the No. 410, it has four-in. jaws, opens four in., and has a depth of jaws of 1 3/4 in. Overall height is 4 5/8 in. and weight is 21 lb. The swivel base is graduated in degrees

Improved Industrial Direct Fired Heaters

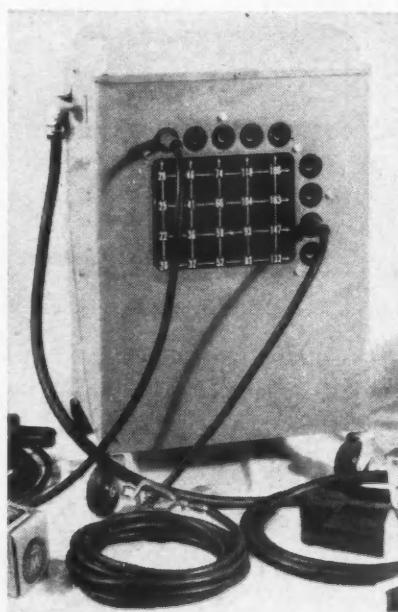
Development of a stainless steel combustion chamber for its commercial and industrial direct fired heater has just been revealed by Dravo Corp., Pittsburgh, Pa.

While stabilized stainless steel has been used in high temperature work, such as ducts for direct fired turbines, this is said to be the first time it has been incorporated in commercial and industrial space heaters. The vulnerable part of an air heater is the combustion chamber where oxidation from high temperatures may cause inefficiency and failure. The application of heat-resisting steel in the Dravo Counterflo heater should prolong its useful life and aid in maintaining high efficiency.

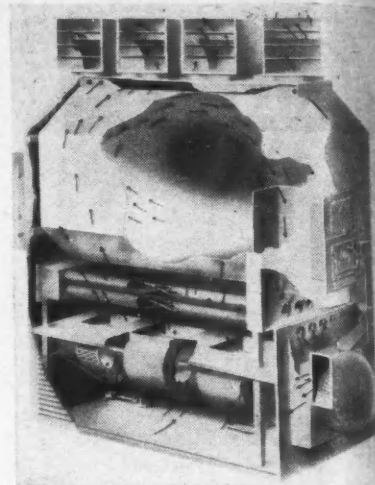
Refractory lining is completely eliminated in the new type. As a result, it is lighter in weight and more compact in size.

General Purpose Transformer

A general purpose transformer arc welder, designed for use on single-phase power line of limited capacity, is available from Westinghouse Electric Corp., Pittsburgh, Pa., in three output ratings; 130, 160 and 180 amp. The welder comes complete with line breaker, power cable with plug and receptacle, insulated electrode holder, electrode lead with holder and adjustment plug, work lead with ground clamp and adjustment plug, electrodes,



Flexarc transformer arc welder

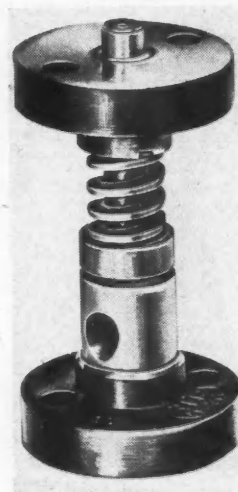


Dravo direct-fired heater with stainless steel combustion chamber

helmet complete with lens and cover glass, wire brush, and a welding instruction manual.

Self Stripping Punch And Die Units

A new line of interchangeable, self-stripping punch and die units capable of operating in smallest press equipment has just been placed on the market by RAAR Mfg. Co., 1663 N. Highland, Los Angeles 28, Calif.



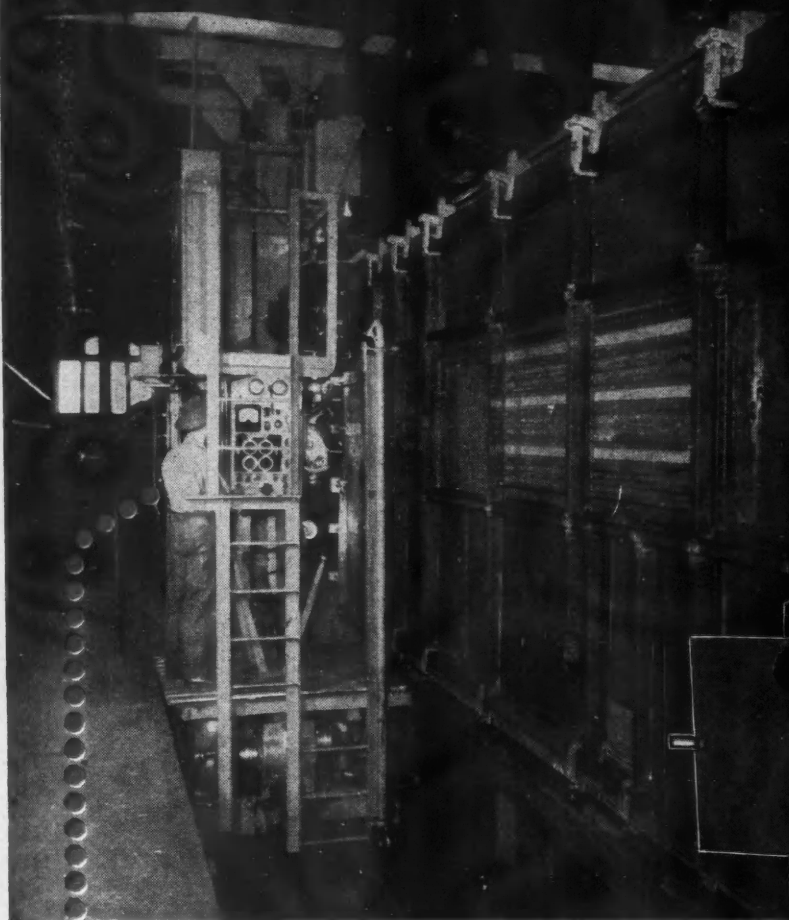
RAAR punch and die unit

Featuring a shut height of only 3/4 in. air slug ejection, close hole centers, simplicity of construction, and wide range of hole sizes (1/32 in. to 1 1/32 in.), RAAR punch and die units are capable of simplified mounting requiring only two screws.

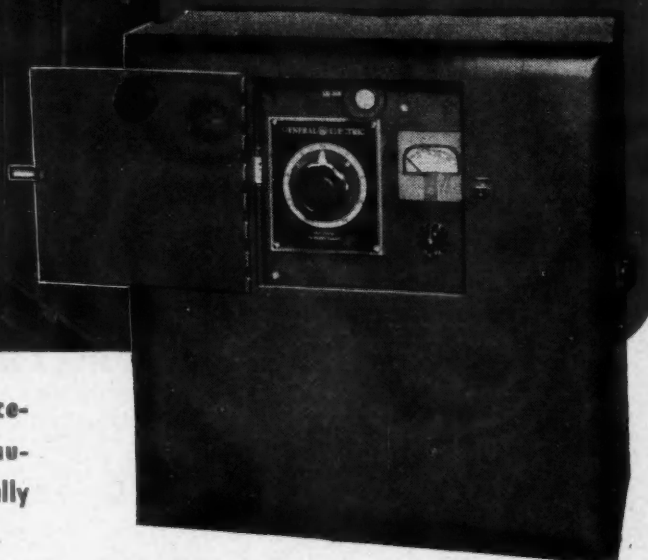
Stripper and stripper guide are removable by a half turn. The punch may be removed from retainers with a light pressure, and changes may be accomplished without disturbing the set-up.

Without retainer, the stepped die construction and height, in conjunction (Turn to page 60, please)

UNIFORM WELDS... *Automatically!*



with G.E.'s
*Current
Regulator*



- The operator of this traveling resistance-welder at the Pullman Standard Car Manufacturing Co., gets consistent welds automatically

Equipped with a G-E electronic current regulator and synchronous control, this resistance welding machine travels the length of the Pullman car producing uniform welds automatically. Each of these welds is of equal strength because the current regulator *automatically compensates for varying line voltage and secondary circuit impedance.*

In welding these cars, two spot welds are made at a time, the spacing between the two varying in accordance with the dimensions of the parts and the strength specifications. As the spacing varies, the length of the secondary circuit changes, and in turn the current is changed.

Where formerly this shift meant frequent readjustments by the operator, guided by an extensive table of machine settings, now just one of two settings is needed, depending on whether the machine is welding Cor-Ten or stainless steel; the current regulator does the rest.

This regulator holds current within plus or minus 2 per-cent of normal, whereas, the unregulated current might vary as much as plus or minus 20 per-cent.

Even when space is uniform, current is affected by varying amount of magnetic material in current loop.

IMPROVES QUALITY

In this, and other applications such as welding propeller blades, metal barrels, etc., this regulator provides uniform quality welds when more or less metal is introduced in the welder throat.

FLEXIBLE OPERATION

The same settings can be used when operating a press-type spot welder, a gun welder connected to the same transformer, or when welding magnetic materials with a press-or gun-type welder.

The current regulator is specially designed for use with G-E electronic resistance welding controls which include heat control by the phase-shift method.

For additional information ask our nearest local office for Bulletin GEA-4220. *Apparatus Department, General Electric Company, Schenectady 5, N.Y.*

GENERAL  ELECTRIC

New Production and Plant **EQUIPMENT**

(Continued from page 58)

with standard die steels, is especially designed for use in cut-off, notching, blanking and other press operations. The die may be rotated in relation to the mounting holes to provide clearance for the slug ejector opening.

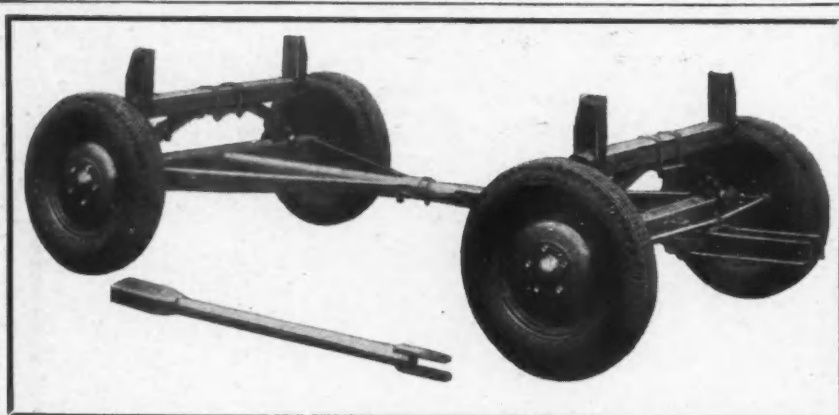
Pneumatic Screw Drivers For Small Screws

Keller Tool Co., Grand Haven, Mich.,

offers to the trade two new pneumatic power screw drivers, especially designed for fast driving of small screws.

Size 12A-1 (Model 1671) has a free speed of 2500 rpm and is designed for delicate screw driving operations. It drives free-running machine screws up to size No. 3 and very small self-tapping and wood screws.

Size 12A-1C (Model 1672) has a free



New Farm Wagon built by ELECTRIC WHEEL CO. and Equipped with TUTHILL Alloy Steel Springs

HERE you see the most advanced design in wagon building—rubber tires—leaf-type alloy steel Springs by TUTHILL—combined in a unit that will withstand severe, year-in, year-out farm service. Designed and built by the Electric Wheel Co., Quincy, Ill. Strong, resilient, durable, TUTHILL meets the test of quality.

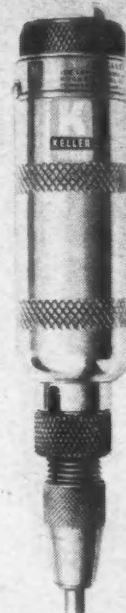
Tuthill makes Leaf-Springs in both standard and special types to suit individual needs. What are your requirements?

TUTHILL SPRING CO.

760 W. Polk St., Chicago 7, Ill.



Quality Leaf-Springs for Sixty-Seven Years



Keller power screw driver

speed of 10,000 rpm and accommodates screws in the No. 3 to No. 6 range. Impacting force of the built-in clutch gives this model added drive. It is recommended by the manufacturer for wood screws, self-tapping screws, and larger machine screws. This tool has no torque adjustment.

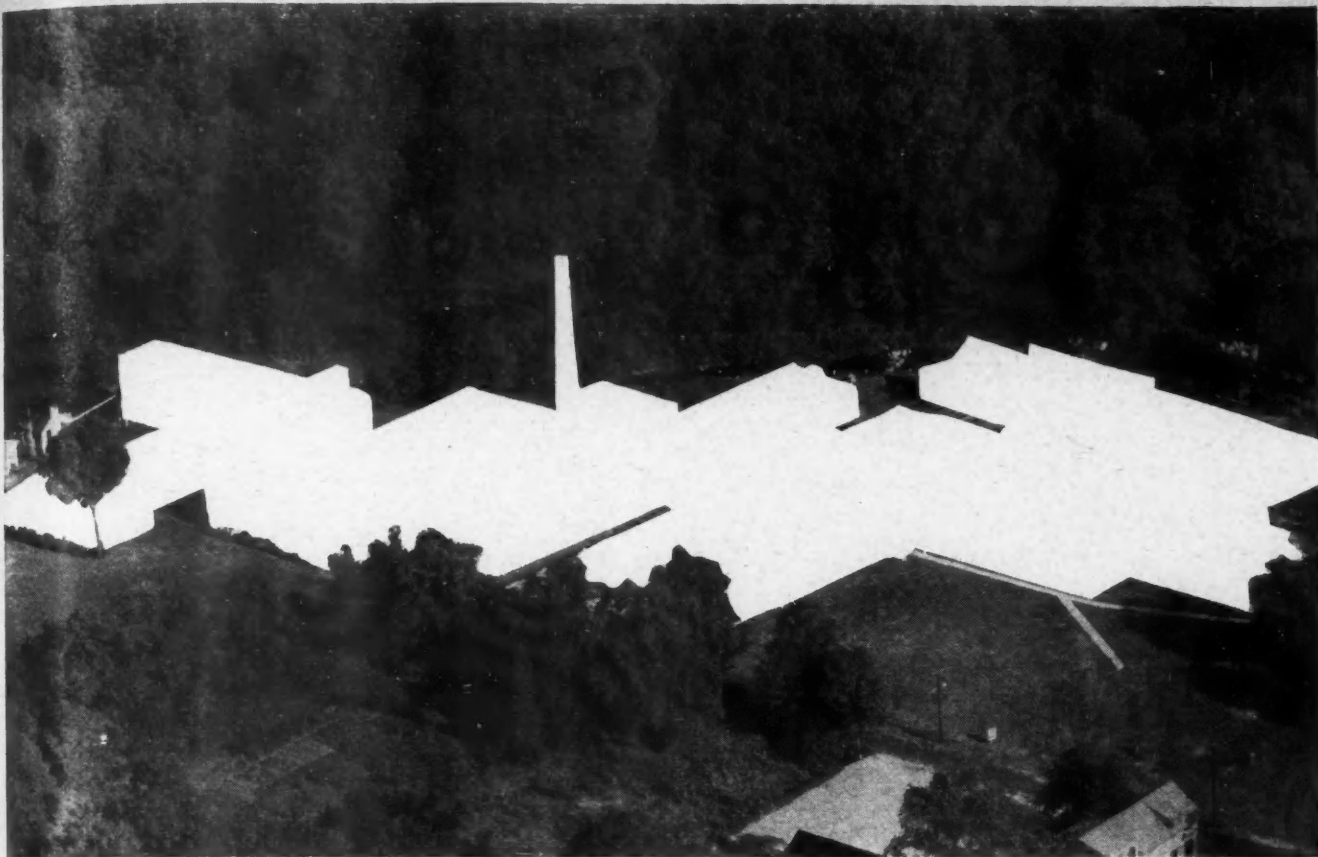
Special features of the new Keller screw drivers include the pneumatic pick-up which enables the operator to pick up screws with the air suction finder and drive them directly into the work.

Accurate Spring Back in Production

Following the fire which destroyed the main plant of the Accurate Spring Mfg. Co. in Chicago on March 3, manufacturing operations have been resumed at 1474 W. Hubbard St., Chicago 22, Ill. In addition, a portion of Accurate's normal output of springs, wire forms and stampings will be produced by Accurate personnel in the factories of other Chicago companies. The Accurate plant at Fowler, Indiana, continues its normal operation.

1946 a Record Year In Tire Production

The production and shipments of automotive tires and tubes for the year 1946 broke all previous records according to the Rubber Manufacturers Association. The 82,013,412 automotive tires produced and the 81,859,657 shipped during the year exceeds the previous all-time record year, 1928 when 77,943,814 were produced and 74,295,913 shipped. In 1941, the last previous peacetime year, production was 61,540,196 tires and 66,163,934 were shipped.



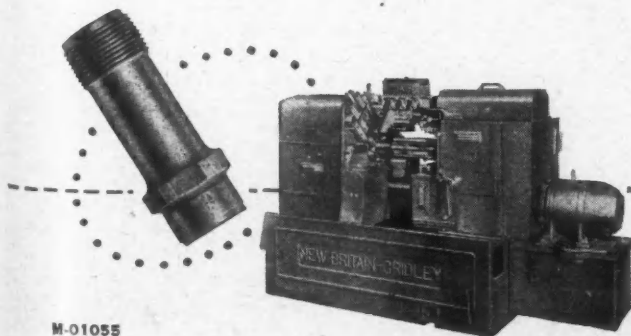
THE PLANT NOBODY HAS EVER SEEN

INDUSTRIAL engineers, labor leaders, management men agree that there never yet has been a manufacturing plant in America that has achieved its absolute maximum of production. Suppose one did exist in which management provided every possible facility, employees used them to the utmost, and management in turn regularly devoted a substantial share of the plant's earnings to invest in more and more efficient machines and methods. Certainly high wages and good returns on stock owners' investments would be no problem to such a business.

Perhaps the absolute ideal plant will never exist, but the tools exist *right now* to enable almost any manufacturer and his employees to achieve spectacular improvements for their mutual welfare. Such an opportunity lies in management's providing the finest, modern production machinery and the latest production methods. In employees' using such machines for all they are worth. Read below how one manufacturer is taking advantage of this opportunity.

EXAMPLE: The aircraft part shown below, is typical of swift, economical, accurate automatic screw machine performance. Speed is maintained by breaking down the inside boring and reaming into four operations. A total of

eleven tools work on this piece which is threaded and cut off in the last position, and close limits of concentricity must be maintained between threads and bore. Regular day by day production: 312 pieces per hour.



New Britain Automatics

**THE NEW BRITAIN MACHINE COMPANY
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April 1, 1947

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Latest Developments in Engine Bearings

(Continued from page 37)

the following order with respect to wear resistance: SAE 660 bronze; SAE 64 bronze, and pure silver (which were equal); SAE 110 tin-base babbitt; SAE 14 lead-base babbitt; SAE 480 bronze; SAE 15 lead-base babbitt; plated lead. Diffusion of indium and codeposition of tin both reduced the rate of wear of lead, a 10 per cent tin content being found materially more effective in this respect than either 4 or 8 per cent indium.

First among the requirements which bearing alloys must meet, as listed in Part I, is score resistance. According to Underwood, the term "scoring" is used rather loosely in bearing parlance, being applied to the marks or scratches on the bearing or shaft caused by dirt that has found its way into the bearing, and also to the effects of incipient seizure. This latter phenomenon, as is well known, results from particles of the bearing material being welded to

the shaft. He thinks it would be in the interest of clarity and precision if different terms were used for the two effects, and suggests that injuries caused by foreign particles, be described as due to "cutting."

Corrosion Tests

Corrosion tests are made in the apparatus shown in Fig. 4, which was designed by the Shell Development Co., Emeryville, Calif. A steel disk is rotated against three flat bearing specimens in a cup of oil. The specimens are supported by ball pivots; and the assembly acts like a Kingsbury thrust bearing, an oil film being formed between the specimens and the steel disc by hydrodynamic action. A constant oil temperature is maintained by an electric heater.

In connection with modern aircraft bearings, it is the overlay which is most likely to be attacked by corrosion. Wright Aeronautical Corp. therefore carried out corrosion tests on bearings with various overlays; and these showed the following losses in mg per sq cm; lead (0.003 in. overlay), 73; lead-indium (0.001 in. overlay, 4 per cent indium), 2.5; lead-indium (0.001 in. overlay, 10 per cent indium), 0.7; co-deposited lead-tin (0.001 in. overlay, 10 per cent tin), 0.2.

Of the various alloys and metals that are or have been used for engine bearings, cadmium has the least resistance to corrosion. High-lead bronze, copper-lead and alkali-hardened lead are moderately resistant, while aluminum alloys, tin-base babbitt, lead-base babbitt of proper composition, cadmium-indium alloys, low-lead bronze and silver are practically immune from corrosion, except that silver is attacked by sulfur under certain conditions.

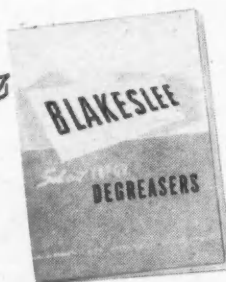
Cavitation Erosion

Another cause of bearing deterioration is cavitation erosion, a phenomenon frequently encountered in connection with ship propellers and centrifugal pumps. One explanation of the occurrence of such erosion in bearings is that cavities form in the oil film on the unloaded side of the bearing, and oil rushes into these cavities as the position of maximum load is approached. This produces a mechanical effect similar to that of water hammer, which results in loosening of bearing material and its subsequent removal. In engine bearings the effect often extends clear through the lining or overlay. A master-rod bearing which has been damaged by cavitation erosion is illustrated in Fig. 5. A research program to determine the resistances to cavitation erosion of the various bearing materials is now being carried through.



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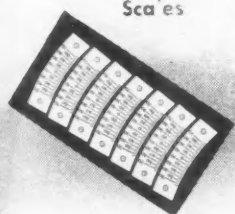
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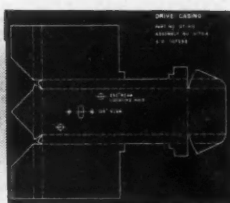
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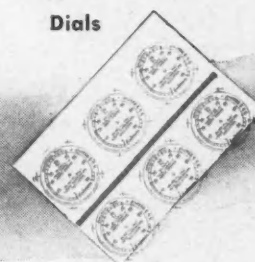
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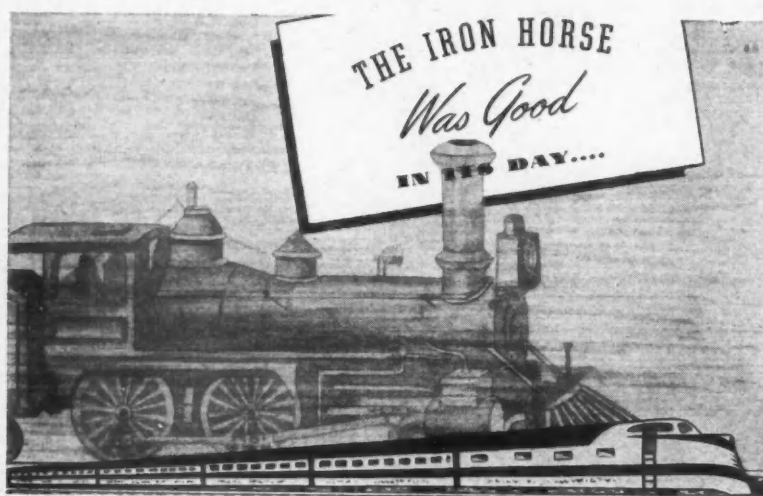
The following information on the design of modern aircraft-engine bearings was gleaned from the paper by Palsulich and Blair. In designing engines, engineers endeavor to limit unit bearing loads to 2000 psi but, in master-rod and knuckle-pin bushings, unit pressures sometimes run as high as 4500 psi and 12,000 psi, respectively, under take-off conditions. Under these conditions the rubbing velocity of the master-rod bearing is 38 fps, while that of the knuckle-pin bearing, of course, is much less, for not only is the knuckle pin of smaller diameter

than the crankpin, but it has a small oscillating instead of rotary motion. In aircraft engine practice the highest rubbing speed occurs in the supercharger bearing, where it amounts to 164 fps under the above conditions. In the case of new designs the bearing loads and rubbing velocities usually are calculated and compared with corresponding values for previous designs, both successful and unsuccessful.

For bearings up to 1.5 in. in diameter, the minimum clearance is set at 0.0015 in. per in. diam; and on bearings of larger size, at 0.001 in. Tightfitting bearings without a steel backing should be installed with a minimum interfer-

ence of 0.0005 in. per in. diam under the worst condition, which may be either at high or low temperature, depending on the coefficients of heat expansion of the bearing and housing, respectively.

The load-carrying capacity of a bearing depends to a considerable extent on the location of oil holes and oil flats. Wright has found that the load capacity may be reduced by nearly 50 per cent if an oil hole, and 75 per cent if an oil flat, rotates through the loaded zone. It has successfully used a circumferential oil groove to increase the oil circulation and provide adequate lubrication without a large bearing clearance.



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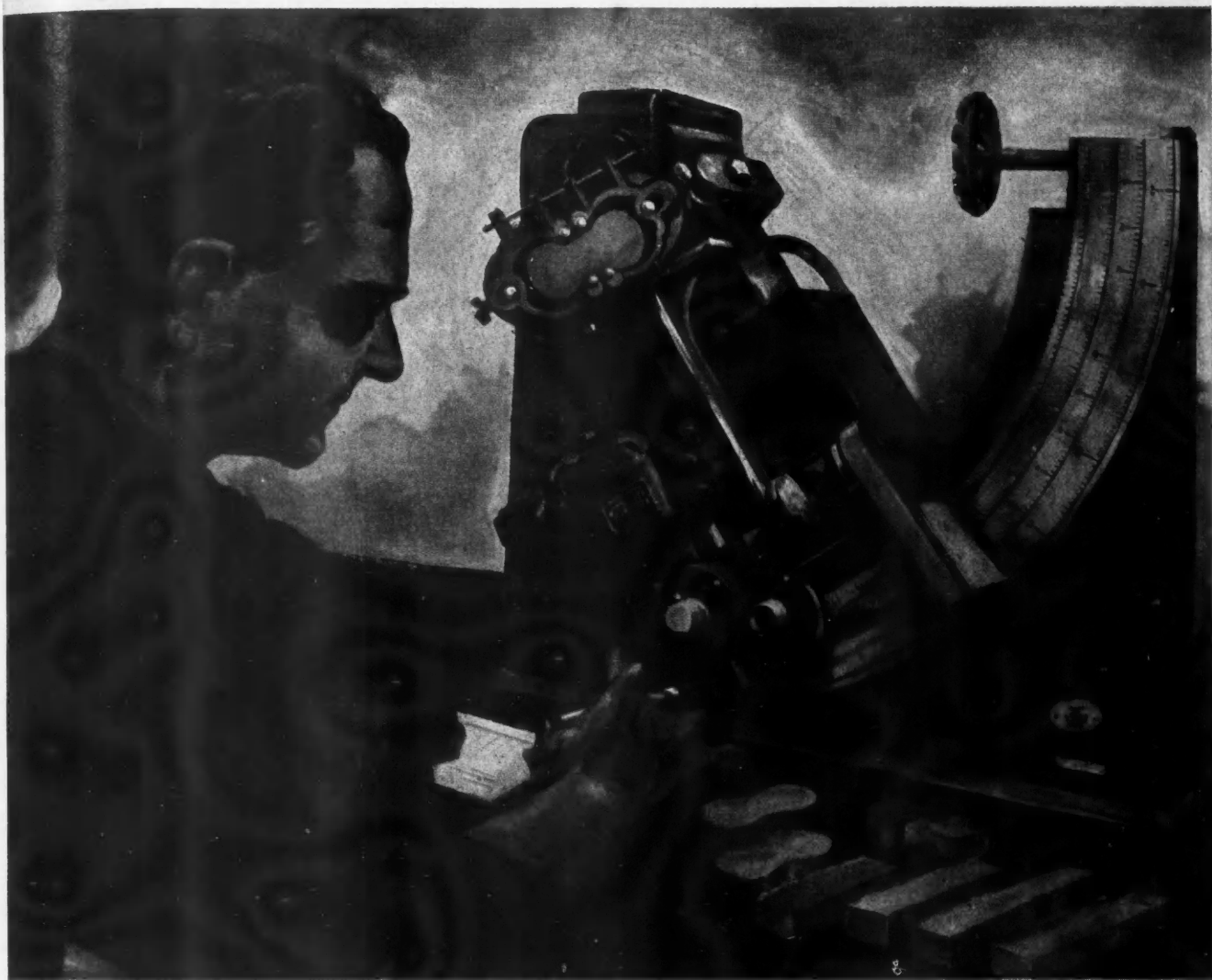
CALENDAR

Conventions and Meetings

- Midwest Power Conference, Chicago, Mar. 31-Apr. 1
- Nat'l Assoc. Corrosion Engineers, National Convention, Chicago... April 7-10
- Amer. Management Assoc. Packaging Exposition, Phila. April 8-11
- Soc. of Automotive Engineers, Aeronautic Mtg., New York..... April 9-11
- Soc. of Automotive Engineers, Transportation Mtg., Chicago..... April 6-18
- Chamber of Commerce of the United States, Annual Mtg., Washington, D. C. April 28-May 1
- Amer. Foundrymen's Association, Annual Convention, Detroit. Apr. 28-May 1
- Soc. of Automotive Engineers, Personal Airplane Mtg., Wichita, Kansas, May 1-2
- The Society of the Plastic Industry, Nat'l. Plastics Exhibition, Chicago, May 6-10
- Soc. for Experimental Stress Analysis Annual Mtg., Chicago..... May 15-17
- Nat'l Assoc. of Motor Bus Operators Annual Mtg., Chicago..... May 21-23
- Amer. Soc. of Mechanical Engineers—Oil & Gas Power Nat'l Conference—Cleveland May 21-24
- Auto. Engine Rebuilders Assoc. Convention, Detroit May 22-24
- Amer. Soc. of Mechanical Engineers—Aviation Mtg., Los Angeles, May 26-29
- Inst. of the Aeronautical Sciences Personal Aircraft Mtg., Detroit.. May 26-27
- Metal Powder Assoc., Spring Mtg., New York May 27
- Soc. of Automotive Engineers—Summer Mtg. French Lick Springs, Ind. June 1-6
- The National Federation of Sales Executives, Los Angeles June 2-4
- Amer. Soc. of Mechanical Engineers—Semi-Annual Mtg., Chicago.. June 16-19
- Amer. Soc. of Testing Materials—Annual Mtg., Atlantic City..... June 16-20
- Amer. Soc. of Mechanical Engineers—Applied Mechanics Div., Schenectady June 23-25
- Institute of the Aeronautical Sciences, Annual Summer Mtg., Los Angeles, Aug. 7-8
- Soc. of Automotive Engineers—West Coast Transportation & Maintenance Mtg., Los Angeles.... Aug. 21-23
- Amer. Soc. of Mechanical Engineers—Fall Mtg., Salt Lake City.... Sept. 1-4
- Amer. Soc. of Mechanical Engineers—Ind. Instruments & Regulators Div., Chicago Sept. 8-9
- Instrument Society of America Conference, Chicago Sept. 8-12
- Society of Automotive Engineers—Tractor Mtg., Milwaukee.... Sept. 17-18
- Natl. Machine Tool Builders Assoc. Machine Tool Show, Chicago, Sept. 17-26



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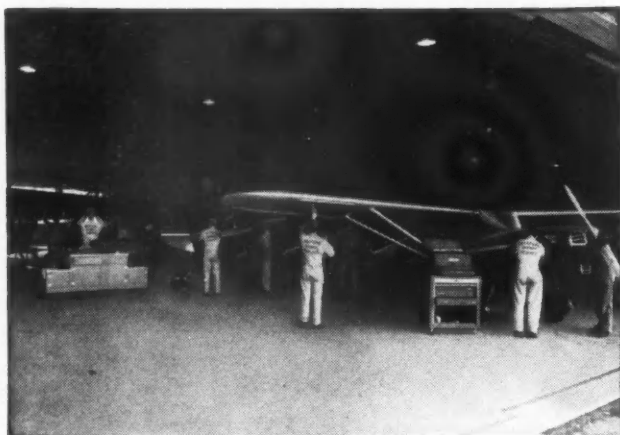
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Jack Moore, president
of Western Skyways,
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How? Through intelligent, vigorous application of the same tested procedures that pay off in *any* business.

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This is the kind of sales and service activity Stinson believes in. Any operator who wants to cash in on personal plane profits—wants to build a strong, sound business that will get stronger with the years—will find the Stinson franchise worth investigating.

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PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE and AVIATION INDUSTRIES. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

76—Hydraulic Power Units

Vickers, Inc.—Bulletin No. 46-43 describes and illustrates new additions to the Vickers line of hydraulic power units. It covers design features and provides tables of capacities, installation dimensions, etc., of the new units.

77—Comparator Screens

Jones & Lamson Machine Co.—A new catalog lists standard glass screens that are available for all models of Jones & Lamson optical comparators. Included are illustrations, descriptions and prices of these standardized comparator screens.

78—Heavy Duty Refractories

Norton Co.—Alundum and Crystolon refractories, brick laying cements, fused magnesia refractories, and Norton refractory grain are described in a 22-page catalog. Properties of refractories, melting points of metallic elements, etc., are among the subjects covered in the 11 tables included in the catalog.

79—Air-Operated Impact Machine

Chambersburg Engineering Co.—New bulletin 2-L-6 provides detailed specifications of the Cecostamp, an air-operated impact machine on which a wide variety of metal shapes are being made from all formable metals. In addition to the machine itself, typical work pieces are illustrated.

80—Material Handling Machines

Trutractor Division of Clark Equipment Co.—The complete line of material handling machines manufactured by this company is presented in a newly-published 36-page catalog. In addition to specifications of familiar models of fork lift trucks and Clarkat and Clarktor towing tractors, the catalog introduces the new Clark "Yardlift" series of pneumatic tired fork trucks. Also illustrated are Clark's handling attachments for use on fork trucks.

81—Electric Hand Tool

Precise Products Co.—New folder on the "Precise 40" electric hand tool and portable grinder. Specific applications are listed and attachments are described and illustrated.

82—Antifoam Agent

Dow Corning Corp.—A technical pamphlet deals with the physical properties of DC Antifoam A, the Dow

Corning silicone compound recently developed for killing foam in aqueous systems. Various methods for using this silicone antifoam are described.

83—Filters for Gases and Liquids

Drico Industrial Corp.—A 46-page

booklet that deals with the underlying principles of efficient filtration and its necessity. The purification of compressed air for engineering industrial purposes, the filtration of air and oil for internal combustion engines and compressors, etc., are covered in the booklet.

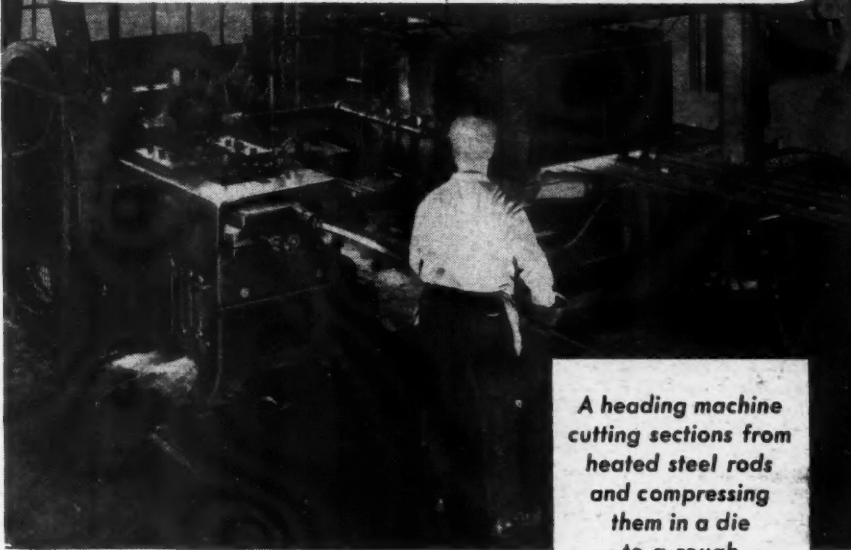
84—Induction Motors

Reliance Electric and Engineering Co.—Two recent bulletins on Reliance "Series C" induction motors. Bulletin C-118 covers protected (open type)

(Next page, please)

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The steel is carefully chosen and inspected, even before it gets to the heading machine. After being "born" here, balls are carefully "brought up," through a long series of grinding and lapping operations, to the unbelievably high standards of finish, sphericity and precision which have made Strom Metal Balls the standard of Industry. Strom Steel Ball Co., 1850 South 54th Avenue, Cicero 50, Illinois.

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frame sizes 203 to 326, with horsepower ratings from ½ to 20 hp. 600 to 3600 rpm. Totally-enclosed, fan-cooled "Series C" motors are described in Bulletin C-125, which deals with squirrel-cage frame sizes 224 to 326, for two and three phase a-c circuits.

85—Powder Metallurgy

Keystone Carbon Co.—Revised and enlarged powder metallurgy catalog that includes many new sizes for their self-lubricating porous bronze bearings. The new sizes are for plain bearings, flanged bearings, and self-aligning spherical type bearings. Of particular interest is the section devoted to the correct design of powdered metal parts.

86—Machines for Pointing and Chamfering Gears

The Cross Co.—A new booklet explains in illustrations and diagrams the Cross "60" Series machines which have been developed for pointing and chamfering spur, helical, and bevel gears; also splines. Complete specifications are included. It shows the actual generating action utilized in Cross' continuous rotary cutting motion.

87—Industrial Air Hose

B. F. Goodrich Co.—A new catalog section on its lines of air hose, used extensively in many industrial fields, has been published by Goodrich. The section describes the construction and advantages of each type, outlines the applications for which it is especially suited and gives data on sizes, braids and plies, pounds for 100 ft lengths, maximum lengths, outside diameters and working pressures.

88—Stainless Steels

Joslyn Mfg. & Supply Co.—A stock list of Joslyn stainless steels is now being published monthly, listing rounds, squares, hexagons, flats, wire and a complete range of angles and channels.

89—Special Drilling Machine

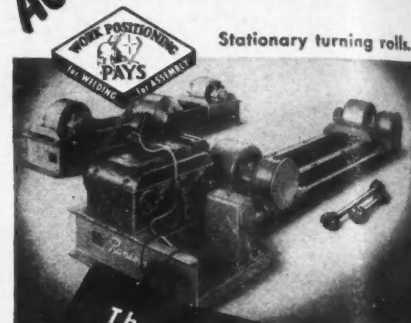
Robbins Engineering Co.—A new catalog describing the Robbins No. 3 Drillmatic that is built as a standard machine expressly for special purpose drilling, reaming, tapping and boring operations.

Air Service Exhibition To Be Held in Holland

The Third International Air Service Exhibition in the Netherlands will be held May 16 to 22 in the grounds and buildings of the Netherlands Annual Fair, Croeselaan, Utrecht. Displays at the exhibition, known as the Aero-Fair, will include aircraft of all types, as well as engines and accessories.

Well-known navigators will participate in a balloon race to be held during the week of the Aero-Fair.

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Self-propelled turning rolls.

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JML007-010

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

General Motors Corp.—Ralph N. Long appointed Assistant Comptroller; Chevrolet Motor Div.—E. P. Feely, National Manager of Fleet Sales.

Graham-Paige Motors Corp. and Graham-Paige International Corp.—F. L. Hopkinson appointed Executive Vice-President.

Reo Motors, Inc.—John S. Pingel, Advertising Manager.

Federal Motor Truck Co.—Warren A. Knechel, Regional Sales Manager for the Eastern Atlantic Seaboard.

Mack - International Motor Truck Corp.—Henry Rowold appointed Assistant General Sales Manager, continues as Vice-President and combines new duties with those of National Accounts Manager, a position he has held for some time.

Kaiser-Frazer Corp.—C. A. Glann and D. L. Mapes promoted to positions

of Assistant General Planning Superintendent; J. F. McCloud appointed Superintendent and J. R. Killham named Supervisor.

Goodyear Tire & Rubber Co.—Russell A. Spoonamore appointed Vice-President in charge of production at factory near Havana, Cuba. Mr. Spoonamore succeeds Marvin A. Ryan transferred as Plant Manager of a larger factory in Sao Paulo, Brazil; Marc W. Laibe named Assistant Purchasing Agent.

Westinghouse Electric Corp.—Robert A. Neal named General Manager of Pacific Coast operations continues as Vice-President.

Bethlehem Steel Co.—A. H. Shonkwiler appointed General Manager of Lackawanna, N. Y., plant.

Hydraulic Press Mfg. Co.—Edmond J. McSweeney elected Vice-President in charge of manufacturing.

Douglas Aircraft Co., Inc. — Leo A. Carter appointed Manager of parent plant at Santa Monica, Cal.

Stewart-Warner Corp., The Bassick Co. div.—Ralph LiBeau appointed General Purchasing Agent.

General Electric Co.—Robert W. Ferrell appointed Manager of Employee and Community Relations of the Affiliated Mfg. Cos. Dept. Mr. Ferrell was formerly Counsel for the General Electric Electronics Dept.

Minneapolis-Honeywell Regulator Co.—Reginald C. Cuhing appointed Sales Manager of the Air Conditioning Controls Div. for Pacific region; H. E. Williams promoted to Eastern Regional Sales Manager of Heating Controls Div.

Colorado Fuel & Iron Corp., Wickwire Spencer Steel Div.—W. T. Stratton appointed Director of Purchases.

Pittsburgh Plate Glass Co.—Richard B. Tucker elected Executive Vice-President; Donald C. Burnham and John A. Wilson, elected to newly-created Vice-Presidencies; Wallace R. Harper succeeds Mr. Burnham as Manager of Plate Glass Sales; William A. Gordon, Manager of Trade Sales; Felix T. Hughes, Manager of Warehouse Sales; Michael J. Batenburg appointed Manager of Paint Advertising.

Firestone Tire and Rubber Co. — George M. Jenkins promoted to Manager of Truck Tire Sales; John J. Riedel appointed Division Merchandise Manager of Home and Auto Supply Dept.

Twin Coach Co.—Harold J. Rennpage appointed Assistant to Field Service Manager; Joseph H. Rill appointed Per-
(Turn to page 74, please)

Johnson TAPPETS

By Manufacturers of Tappets Exclusively

GIVE YOU

- ✓ SPECIALIZED DESIGN
- ✓ SPECIALIZED PRODUCTION
- ✓ SPECIALIZED SERVICE



The millions of **JOHNSON** Tappets in use today testify to the value of doing business with a concern whose business is tappets. By integrating years of engineering experience and skilled craftsmanship with the production of tappets exclusively, **JOHNSON** has become recognized as a leading manufacturer of all types of precision tappets. As a result of this specialization, **JOHNSON** Tappets are of superior design and construction . . . built to improve engine performance, last longer, and give better service.

JOHNSON engineers will give you the benefit of these advantages in discussing the tappet applications in your engines.

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MUSKEGON, MICHIGAN
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1/4" Drill Model 109

*Actual
Size*

**Send Production UP
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Where there's a hole to drill... or a nut to turn... or a screw to drive in production-line work—do it the faster and better way with ARO Air Tools! You can't beat 'em for day-in and day-out dependability... stall-proof power... fatigue-lessening light weight... production-boosting performance! Specify ARO precision-built tools. Write for catalog. See your Aro Jobber. The Aro Equipment Corp., Bryan, Ohio.

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Only WARNER ELECTRIC BRAKES

Give you *all* these
Time-and-Money-Saving Advantages

Engineered to meet the Specific Needs of Trailer Braking

SIMPLICITY — No other brakes equal Warner Electric Brakes for simplicity of design and construction. Full clearance under tractor and trailer. Nothing to get knocked off, leak, chatter or freeze. No exposed braking equipment . . . no rods to rattle . . . no tubes to split . . . no troublesome boosters and connections. Easy to install . . . no tapping of manifolds . . . no expensive motor work.

INSTANTANEOUS, POSITIVE ACTION — Positive-acting braking power is developed within the brake itself. Because the braking mechanism is *electrically controlled*, there is no time lag. Regardless of distances from cab to rear trailer wheels, any amount of stopping power is *instantly available*.

CONTROLLED BRAKING POWER — Driver can pre-set the "Vari-Load" dial on dash so it adjusts the electric brakes on the trailer to give correct braking to meet road and load conditions.

SYNCHRONIZED OPERATION WITH EITHER AIR OR HYDRAULIC SYSTEMS — Warner Controller synchronizes hydraulic or air brakes on tractor with Electric Brakes on trailer. Regular tractor foot pedal then operates both systems *together*.

ALL-PURPOSE CONNECTION — One rugged Electrical Cable Connection provides contacts for Brakes, Running and Parking Lights, Stop and Turn Signals — ALL electrical contacts. As easy to plug in as a radio.

UNMATCHED ECONOMY — Warner Electric Brakes are inexpensive to install due to their simplicity. Use only as much current as tail light. The most important economy factor is that they require minimum of servicing thus preventing costly delays and tie-ups of trailer equipment.

PROVED DEPENDABILITY — Warner Electric Brakes have been performance-proved by leading tractor-trailer fleet operators during many years of efficient, trouble-free service — also on thousands of military vehicles. It is noteworthy that 80% of all power-brake equipped trailing vehicles purchased by the government during World War II — had Warner equipment.

GREATER SAFETY — When both the tractor and trailer are equipped with Warner Electric Brakes their *instant* "stopping power" under *absolute control* assures greater safety. All brakes "come in" at the same time, but with various *amounts* of power. Therefore, rear trailer wheels get the effect of coming in first — and the tendency to skid or jack-knife is prevented, thus giving protection to driver and load — and avoiding costly repairs and tie-ups of equipment.

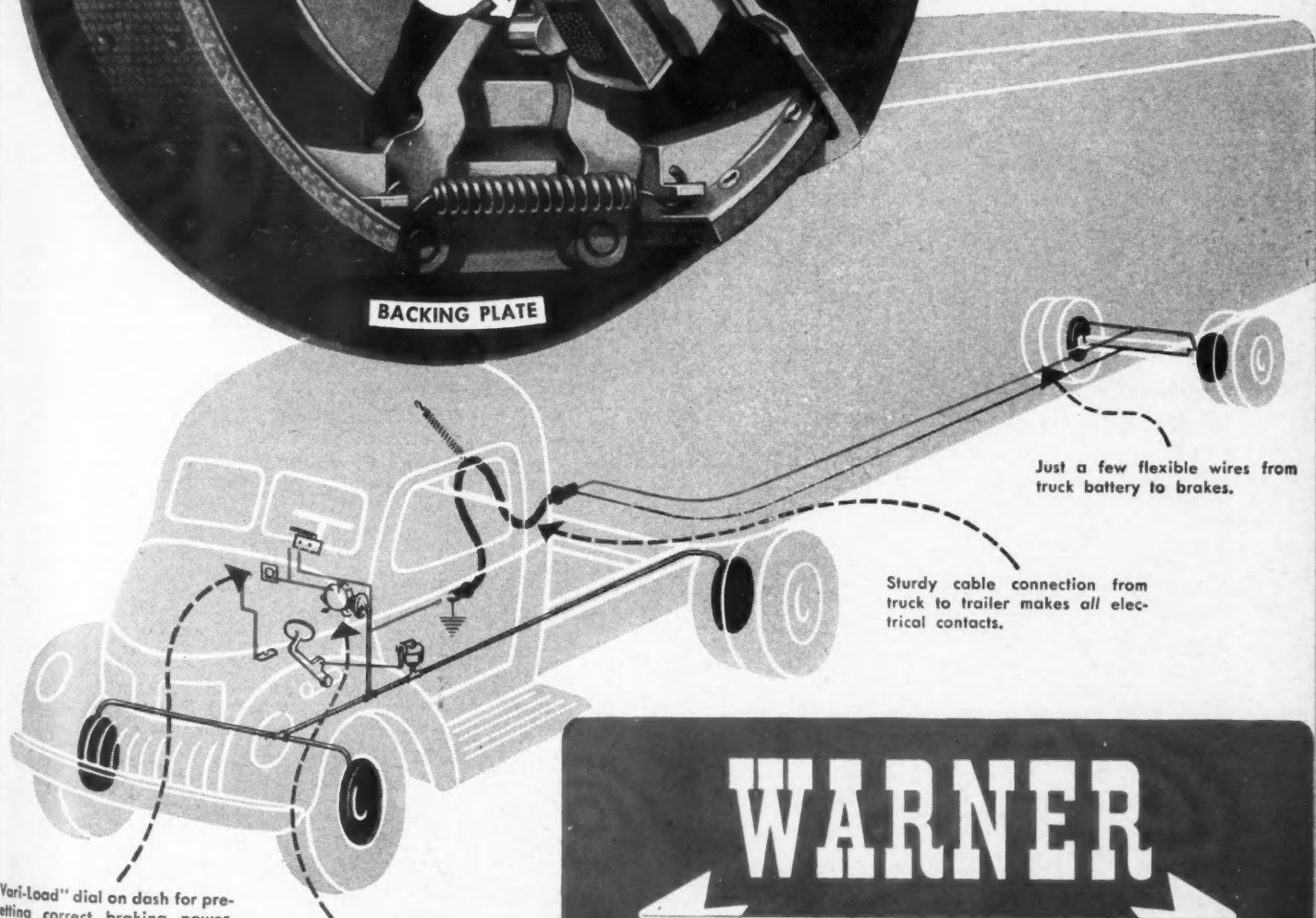
For best performance and customer satisfaction, standardize on Warner Electric Brakes for your trailers. Write for illustrated literature explaining all their advantages.

WARNER ELECTRIC BRAKE MFG. COMPANY
BELOIT, WISCONSIN

Specialists in the manufacture of Electric Trailer Brakes since 1927



The Warner Electric Brake is a simple mechanical brake, operated by an electro-magnet and armature disc. Each wheel is a complete brake unit. The braking power is generated within the brake itself. A wire to the battery and a controller complete the system — famous for its simplicity,



Just a few flexible wires from truck battery to brakes.

Sturdy cable connection from truck to trailer makes all electrical contacts.

"Vari-Load" dial on dash for pre-setting correct braking power.

Controller operates trailer's electric brakes in unison with truck's hydraulic or air brakes.

WARNER

ELECTRIC BRAKES

PERSONALS

(Continued from page 70)

sonnel Director of the parent company and its subsidiary, Fageol Products Co.; **R. P. Johnston** named Assistant to the Personnel Director.

United Aircraft Corp., Hamilton Standard Propellers Div. — **Robert W. Russell** appointed Administrative Assistant, consolidating his new duties with those of his former assignment as Assistant to the General Manager and continuing as a Vice President of United

Aircraft Service Corp. and Assistant Secretary of United Aircraft Corp.

Carrier Corp.—**John F. Chester** appointed Public Relations Director.

Philadelphia Tube Co. — **David E. Lukens** appointed General Manager. Mr. Lukens will continue as Engineering Representative for Autogiro Co. of America.

American - Marietta Co., Keystone Asphalt Products Div.—**T. R. Johnson** appointed General Manager; **Lib Panichi** promoted to Production Manager of Chicago Heights Plant.

American Brake Shoe Co., National Bearing Div.—**Emmett A. Williams** appointed Vice-President in Charge of Operations; **I. E. Cox** appointed Vice President in Charge of Engineering.

Air Associates, Inc. — **Lt. General Barney McK. Giles (Ret.)** elected Vice President.

Aeroquip Corp.—**Lester J. Henderson** appointed General Sales Manager.

D. A. Stuart Oil Co. — **Edward F. Dykstra** appointed Advertising and Sales Promotion Manager.

Titeflex, Inc. — **Gordon J. Wygant** named Assistant Sales Manager.

Perflex Corp.—**V. Robing Tate**, Vice President and Secretary, elected Executive Vice President; **Hugh Kelly** named Chief Engineer.

Sterling Engine Co.—**Robert Russell** elected member of Board of Directors. Mr. Russell is Assistant Sales Manager of Westinghouse Electric International Co.

Harnischfeger Corp. — **Ralph D. Holcomb** appointed General Sales Manager.

Ohio Rubber Co.—**Karl N. Carter** appointed Manager of General Sales exclusive of automotive and other accounts served by Detroit office.

Galvin Mfg. Corp.—**G. A. Godwin** appointed Plant Superintendent.

Four Wheel Drive Auto Co. — **M. O. Stockland, Jr.**, Manager of newly consolidated Sales Promotion and Advertising Departments.

Divine Brothers Co.—**William C. Beddoe**, Advertising and Sales Promotion Manager.

William C. Durant

William C. Durant, one of the automobile industry's most colorful pioneers and organizer of General Motors, died on March 18 in New York City following an illness of more than four years.

Mr. Durant's volatile rise started modestly in 1886 with the Durant-Dort Carriage Co. He moved into the field that made him famous by taking over in 1904 the Flint Wagon Works which had acquired the rights to an automobile designed and built by David Buick. The incorporation of the Buick Motor Co. at \$10 million in 1905 and its success enabled him to organize in 1908 General Motors and buy out Cadillac, Oakland, Oldsmobile and Northway; capitalized at \$12,500,000, GM had sales of over \$34 million in 1909 and a net profit of \$11 million. Buick, Elmore, Cartercar, Rainier, Welch, Welch-De-

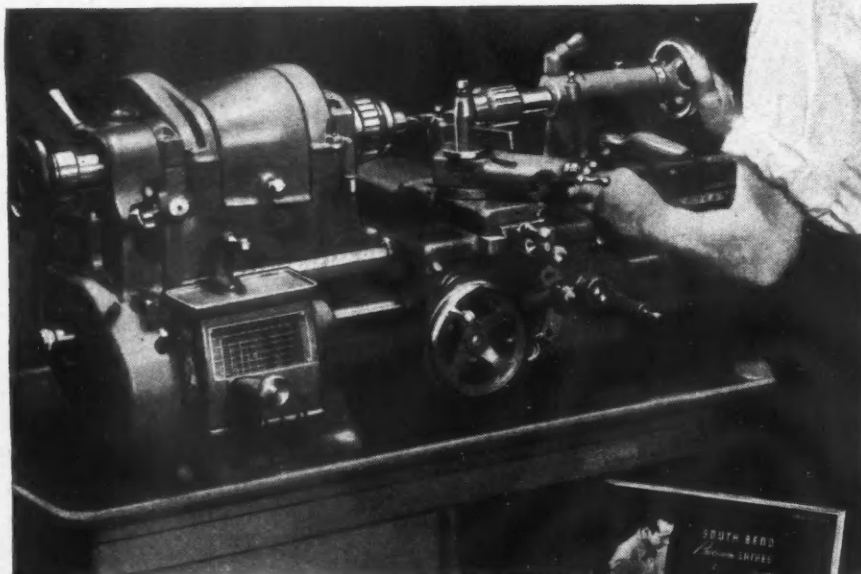
(Turn to page 76, please)

SOUTH BEND LATHES

VERSATILE... ACCURATE

The versatility and accuracy of South Bend Precision Lathes make them highly efficient on toolroom and experimental work. Their versatility reduces set-up time to a minimum and facilitates the handling of a wide range of jobs. Their accuracy is more than a match for the most exacting requirements.

There are also many classes of production machining—especially where tolerances are important—that can be performed better on South Bend Precision Lathes. Appreciable savings in machining time, capital investment, operating effort, and power consumption can often be made through their use.



Write for Catalog 100-F. Describes Toolroom and Quick Change Gear Lathes with 9", 10", 13", 14½", and 16" swings; and Precision Turret Lathes with ½" and 1" collet capacities. Prices are only slightly higher than pre-war—and improvements developed to meet exacting war production requirements give you greater dollar value.

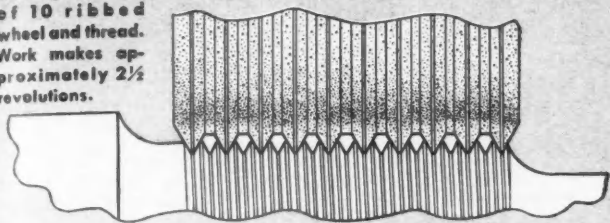
Building Better Lathes Since 1906



SOUTH BEND LATHE WORKS
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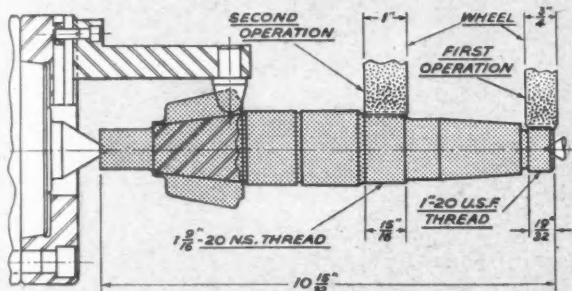
Enlarged view
of 10 ribbed
wheel and thread.
Work makes ap-
proximately 2½
revolutions.



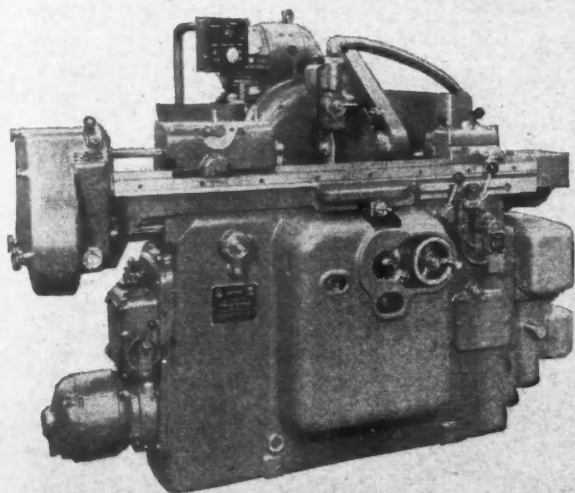
HERE'S *Production* THREAD GRINDING . . .

Ground from the Solid
in *15 seconds*

1"-20 N.S. THREAD, GROUND FROM THE SOLID



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JONES & LAMSON AUTOMATIC THREAD GRINDERS

"PRODUCES NEAR PERFECT THREAD"

"EXPENSIVE HAND DIE OPERATIONS
ELIMINATED"

"NO MARRED THREADS ON THE
ASSEMBLY LINE"

"WHEEL COST PER PIECE LESS THAN
THREAD HOB AND CHASER COST"

The Timken Detroit Axle Company, promi-
nent manufacturer of heavy truck axles,
has this to say about a Jones & Lamson
Automatic Multi-Ribbed Thread Grinder
installed to grind the threads on axle drive
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"The threads are machined as a last opera-
tion following heat treat and grinding of all
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machine produces a near perfect thread
and eliminates all expensive hand die
operations along the line and overcomes
marred thread on the assembly line".

"... the grinding of threads also reduces
direct labor costs and indirect cost of cut-
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Jones & Lamson Automatic Multi-Ribbed
Thread Grinders offer remarkable oppor-
tunities for economy with better quality in the
mass production of threaded parts. Ask for
one of our engineers to tell you more about
multi-ribbed production thread grinding.



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Manufacturer of *Automatic Thread Grinders* and Universal Turret Lathes •
Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical
Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies



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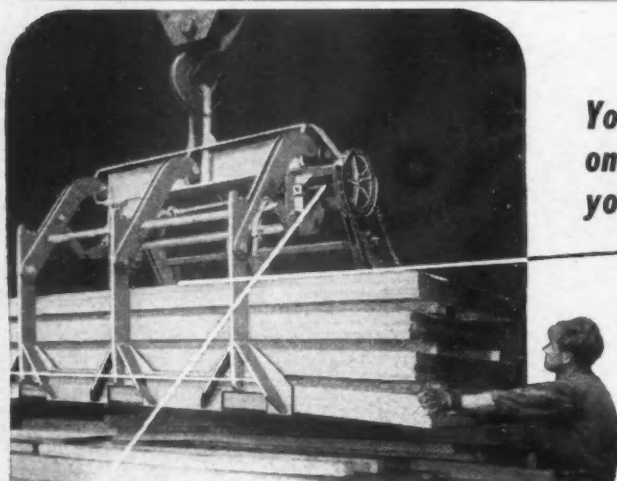
SOLVE your spring requirements the simple way—by putting them squarely up to B-G-R.

PROFIT by long-time experience in springs and intricate metal parts.

SAVE time and trouble by letting B-G-R recommend.

**Tel. it to B-G-R—or tell it by letter or face-to-face. It's satisfaction either way.*

BARNES-GIBSON-RAYMOND
DIVISION OF ASSOCIATED SPRING CORP.
Detroit • Ann Arbor
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**You can produce
only as much as
you can handle** *

WHEN you use C-F Sheet Lifters to load, carry and unload loose or bundled sheets in and out of storage, you keep no machine or operator idle, waiting for material.

C-F Lifters provide a faster, safer and more economical method of handling sheet stock because they carry more sheets per load, have a tong action that grips loads tightly, preventing stock slippage or sag, yet design features such as wide bearing surfaces give full protection to stock edges. One man end or remote cab control keeps operator away from sides—stock can be

loaded or unloaded in close quarters with resulting savings in storage room.

Jaw controlling mechanism provides infinite adjustments from minimum to maximum widths. Control is fast, positive. C-F Lifters have standard and optional equipment that will exactly meet any materials handling requirement you may have. Lifters are available in capacities from 2 to 60 tons or larger, in standard or semi-special designs. Write for new Sheet Lifter Bulletin—just off the press. CULLEN-FRIESTEDT CO., 1322 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

troit, Rapid, Reliance, and Randolph were among the automobiles also taken over by GM in the succeeding years. The panic of 1910 coupled with an ill-advised move into the electric light business, forced him into a vice-presidency and out of control of GM.

With the organization of Chevrolet Motor Co. which in 15 months had assets of over \$90 million, he fought his way back into control of GM in 1915, and Chevrolet became part of GM. As a result of the depression of 1920 Mr. Durant was forced out of GM.

Six weeks later, with the financial help of friends, he incorporated the five million dollar Durant Motors and by the end of 1922 the company by acquisition and otherwise was producing Durants, Stars, Locomobiles, Flints and Mason trucks, had assets of \$62 million and plants in 28 cities. His heavy market activity in the late twenties coupled with the stock market crash in 1929 ended Durant Motors, and from then on Mr. Durant, although moderately successful, never regained his place in the American automobile business.

Ford Cold Heading Dept. Moved to New Quarters

The Ford Motor Co. has shifted its cold heading department into entirely new quarters at the Rouge plant. Having a floor space of 90,000 sq ft, the new department contains 814 pieces of machinery, including 237 cold heading machines; and is tooled for about 5000 active parts, ranging from screws with 0.140 in. diam to 1.25 in. diam. All threads are produced by thread rolling; and in the cold heading of certain small parts, special dies containing cemented-carbide inserts are used. Some recent tests of these dies conducted in regular production show a life of about 1,500,000 pieces per die as contrasted with a life of about 3000 pieces for conventional die steel.

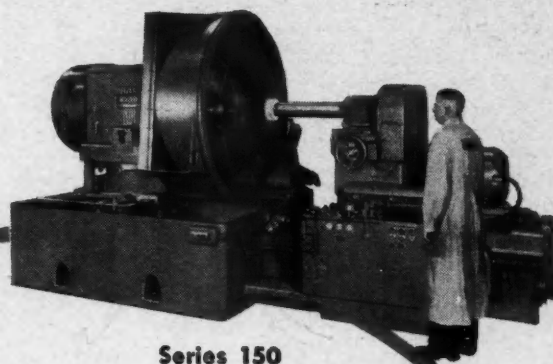
Material handling at this new cold heading plant includes a floor level slat conveyor for moving containers filled with parts in the aisle between rows of machines; and another conveyor running the entire length of the building for transporting finished parts from one end of the building to the stores at the other end. In addition, Ford will have a fleet of Clark Equipment fork trucks for transporting coils of raw material and loading them onto reels at each machine.

Jacobs Buys Jacobs Engine

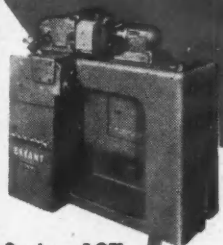
The Barium Steel Corp. has sold the Jacobs Aircraft Engine Co. of Pottstown, Pa., for \$1,500,000 to A. R. Jacobs, Vice President and General Manager, according to announcement made by the Barium Corp.

A fine line

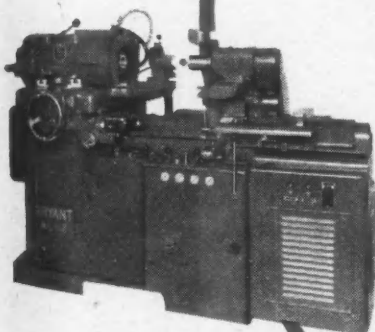
of Internal Grinders
for every tool room
and production
requirement



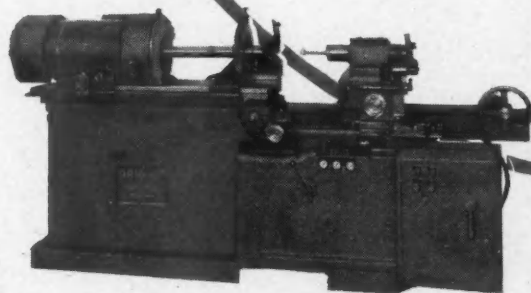
Series 150



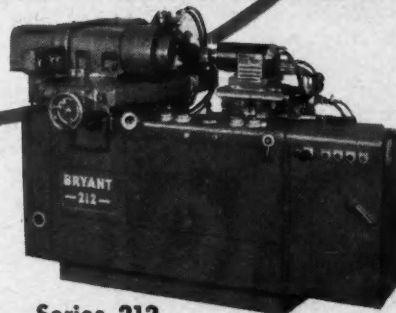
Series 107



Series 112



Series 112 M



Series 212

BRYANT has designed and built precision internal grinders for 38 years. Today, their completely modern line covers the grinding of holes from .040" to 50" in diameter. Standard and special machines will grind straight, tapered, curved and irregular holes, or any of these in combination. Face and hole grinding can be combined to assure squareness. Cams and irregular holes can be ground by using the cam attachment. The Series 150 has a face plate 60" in diameter and will swing work up to 50". A special machine will take 100" swing. The Series 107 is equipped with Bryant High Frequency wheelheads giving speeds up to 100,000 R.P.M. for extremely small bores. Maximum swing of the 107 is 9". Series 112 machines are for general purpose tool room work. They incorporate many quick-changeover features and will swing 16". The 112-M machines are similar to the 112, but have provision for grinding long bores such as machine tool spindles. Series 212 grinders are completely automatic and will grind bores from $\frac{5}{16}$ " to 6" in diameter. The High Frequency head is used on the 212 for maximum efficiency on small bores. All these machines incorporate the exclusive Bryant feature of hardened and ground cylindrical slide construction and three-point bearing. Complete specifications are available on all Bryant precision internal grinders — write today.

BRYANT Postwar Development

Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



BRYANT

April 1, 1947

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Plymouth Production "Firsts"

(Continued from page 32)

metal assembly prepared as a unit on a merry-go-round sub-assembly station nearby. Plymouth has discarded this practice. Instead, the sheet metal and radiator assembly are installed directly to the body in the body department.

To assure alignment of parts and to facilitate assembly, the first step is to attach a front sub-frame which serves as a framing fixture. Around this the operators fit the front fenders, and attach the radiator assembly. Mean-

while, other workers seated on special dollies rolled on casters, wheel themselves inside of the front structure where they make up the fastenings most conveniently. Following completion of the front-end assembly, the sub-frame is removed and the body is ready for the final line.

The body drop is an interesting assembly line detail since practice varies in each plant and is governed to some extent by plant layout. For example,

many plants of multiple story type will trim bodies on the floor above, then drop them onto the final line through an opening on the floor. Plymouth practice for many years was to set the trimmed bodies on the hardware assembly conveyors and then deliver them to the final line by means of a traveling car which gripped the body directly to its carriage. The operator then rode the car to the line and lowered the body onto the chassis.

The new arrangement is quite revolutionary in character. The monorail originating at the hardware line continues on its course to the final line and moves directly over the line ready for the drop. Just as the conveyor turns and begins to drop in elevation it meets a series of guide rails. The forward end of the suspension rides on a rail which keeps the front end somewhat higher than the rear. The mechanism of the body drop from this point on is semi-automatic to the extent that an operator controls the timing of the drop from a control cabinet. Aside from timing, the operation may be considered as being fully automatic.

The body approaches the chassis with front end higher than the rear to facilitate threading the steering column through the floor board. As this maneuver is completed, the assembly operators begin to bolt down the rear end, thus, in effect, hinging the body at this point. The guide rails then lower the front end for fastening, and the suspended hooks automatically release and are disengaged.

Automatic Sheet Metal Painting

Remarkable for its automaticity and excellent control of quality is the arrangement for spraying all external sheet metal. Plymouth has provided a series of spray booths, each one handling similar parts such as fenders, hoods, etc. After applying the prime coats in dip tanks, and baking, the sheet metal is segregated and placed on the proper conveyors for final synthetic enamel spray and drying. Unique feature of the system is the development of special spinning fixtures, suspended from the conveyor, which take a number of fenders or hoods or other items at a time, hung vertically as illustrated. Each of the fixtures has a large roller at the upper end for engagement in the spinning mechanism of the rails within the spray booths.

Each of the spray booths is provided with a fully-automatic spray gun controlled in its function by an electrically-operated control cabinet. The spray gun is mounted on a mechanism, controlled by cams within the cabinet, to provide automatic sweeping of the contour of the stamping. The mechanism has movement in-and-out, simultaneously coordinated with movement up-and-down. In addition, the cam gear constrains the spray gun to tilt properly so as to reach the upper curved surface of a fender, for example.

(Turn to page 82, please)

Ingenious New Technical Methods

To Help You Simplify Production



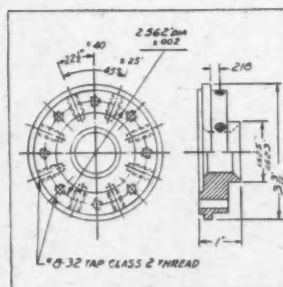
Precision Adapter for Drill Presses Perfects Alignment—Prevents Drift!

The new Aetna Adapter, of aluminum alloy, fits the columns of most small drill presses—assures accurate milling and accurate deep hole drilling—without a drill jig. It firmly and accurately holds interchangeable drill bushings close to work.

Precision alignment is accomplished through an eccentric aligning bushing, which once set needs no further adjustment. Filler bushings cover the entire bushing range up to 1/2". Stops to locate the piece to be drilled, are attached to the press table or directly to the adapter. Milling chatter is avoided. Chip interference is eliminated. Overlapping holes can be drilled without punch marks, or indication of run-out, with drills as small as 1/32" diameter. 1/4" holes can be drilled more than 6" deep with as little as .006" drift.

Accuracy in work is achieved best by alert workers. That's why many plant owners make chewing gum available to all. The chewing action helps relieve monotony—helps keep workers alert, aiding them to do a better job with more ease and safety. And they can chew Wrigley's Spearmint Gum right on the job—even when hands are busy.

You can get complete information from
Aetna Mfg. Co., 250 Chicago Ave., Oak Park, Ill.



Example of piece drilled with Aetna Adapter



AB-59

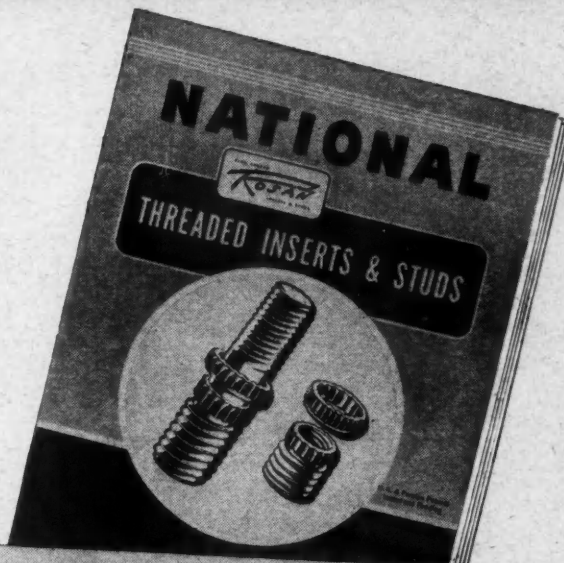


USE THIS THREADED STEEL HOLE FOR TIGHT FASTENING IN SOFT MATERIAL

You can ensure fastenings that will stay tight in soft metals, plastics or bonded metals, even under vibration and torque.

The Rosán Fastening System provides a threaded steel hole (or stud) which holds firmly in the parent material. The design is based on a serrated ring which locks an insert or stud in position and so prevents loosening or turning. It can be removed by drilling—and replaced—without disturbing the parent material.

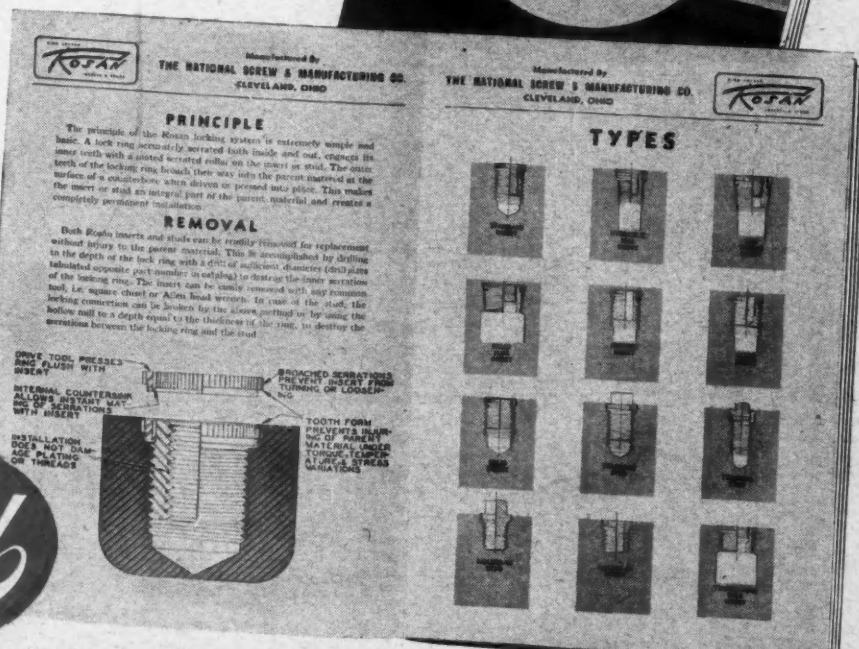
Send for this useful catalog of Rosán Threaded Inserts and Studs by *National*.



Other "National" Specialties Include:



- Clutch Head Screws
- Davis Blind Fasteners
- Drake Lock Nuts
- Dynamic Lock Nuts
- Hi-Shear Rivet Pins and Collars
- Huglock Nuts
- Laminar Flow Screws
- "Lok-Thred" Studs
- Marsden Lock Nuts
- Phillips Recessed Screws
- Place Bolts
- Scrivets
- Sems



THE NATIONAL SCREW & MFG. COMPANY, CLEVELAND 4, OHIO

How many non-ferrous alloys can you Name?

The number of possibilities is almost unlimited, of course. But in foundry practice, the most important are copper base alloys, aluminum base alloys and magnesium base alloys, all produced in time-tested analyses by Federated Metals Division.

For foundry casting, Federated makes all of the commercial copper base alloys . . . the aluminum base alloys for use "as-cast" or heat-treated, and for sand molds, permanent molds or die castings . . . magnesium base alloys . . . deoxidizers and addition agents.

From Federated's complete line you can select alloys that produce castings of special ornamental value, high strength-weight ratio, excellent wearing qualities, special resistance to corrosion, or sharp detail.

A Federated technical representative will help you select the right alloy for your special casting needs. For the office nearest you, consult your phone book or write *Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N.Y.*

Federated Metals is first with a complete line of metals for the non-ferrous foundry:

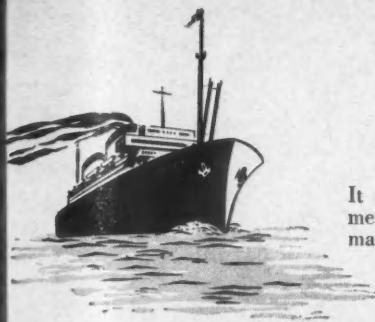
manganese bronzes
aluminum bronzes
silicon bronzes
tin bronzes
red and yellow brasses
nickel silvers
high copper alloys
aluminum base alloys
magnesium base alloys
zinc base alloys



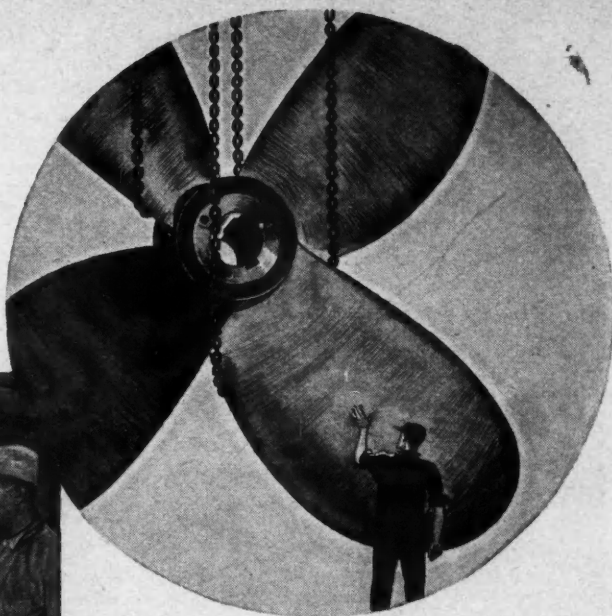
Federated METALS DIVISION

AMERICAN SMELTING AND REFINING COMPANY



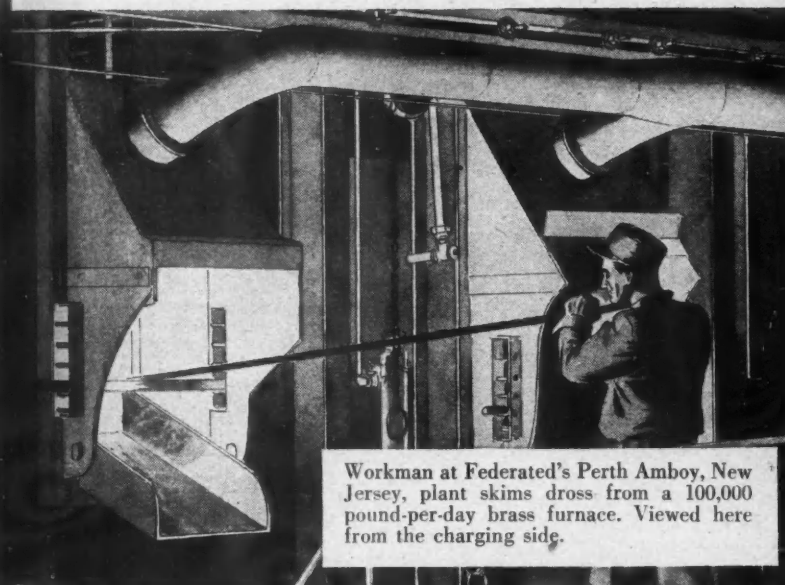


It took 90,000 to 100,000 pounds of metal to cast this 22-foot diameter manganese bronze propeller, weighing 60,000 pounds finished. It is among the largest ever made. Picture: courtesy The Baldwin Locomotive Works.



❖ Casting aluminum on a straight-line casting machine. The metal is tapped from a reverberatory furnace having a daily capacity of 70,000 pounds.

The aluminum ingot molds, part of an endless conveyor, are readily stripped at the discharge end of the machine, and drop into skid-bins for transfer by fork trucks.

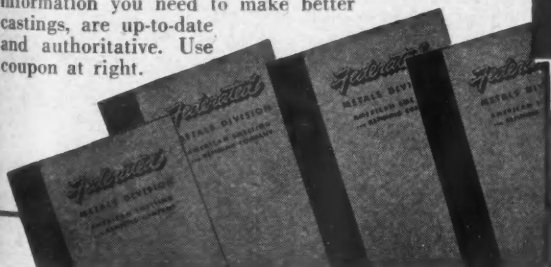


Workman at Federated's Perth Amboy, New Jersey, plant skims dross from a 100,000 pound-per-day brass furnace. Viewed here from the charging side.



JMLCo F:DI

Federated Metals booklets, covering information you need to make better castings, are up-to-date and authoritative. Use coupon at right.



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**IN OIL
AND GAS**

Atlas Drop Forgings have a solid place in the Oil and Gas Industry. Operating problems peculiar to this industry, such as high pressure, temperatures, abrasion and torsion strain, are understood and handled accordingly in the big Atlas Drop Forge plant.



Courtesy Michigan Department of Conservation

ATLAS DROP FORGE COMPANY • LANSING 2 MICHIGAN



Atlas Drop Forgings also Excel in

Agriculture	Diesel
Air Conditioning	Earth Moving
Automotive	Food Machinery
Aviation	Marine
Bridge	Railway
Compressor	Refrigeration
and Many Other Divisions of Industry	

**ATLAS
DROP FORGINGS**

The important point is that the paint spraying is a fully automatic operation from start to finish. Another feature of the conveyor is provision for intermittent forward movement of the line. It is so timed that work receives its first coat of enamel, stops for about a minute to permit the coating to set, then moves to the next station for a second coat of enamel. The last coat is given about five minutes to set before the conveyor continues into the final drying oven.

The final drying oven is an enormous piece of equipment—40 ft wide and 200 ft long—accommodating five separate conveyor lines. Work is held at 270 F for 25 minutes.

Profiting by previous experience, a simple step has been taken to preserve the quality of finished sheet metal parts. At one time fenders, hoods, and other painted parts were stacked on the floor prior to delivery for assembly. But this practice encouraged chipping or scratching of the finish. In the present set-up, the sheet metal parts are transferred to a storage conveyor after drying. This consists of a conventional bar type conveyor unit geared to move at a slow rate. As a bar reaches the end of the line an automatic trip switch shuts off the conveyor until an operator removes the load.

Fender polishing and welding operations in this area offer interesting examples of mechanization to facilitate

handling and to reduce cost. There are two lines for fender polishing. They consist of straight line floor conveyors fitted with universally adjustable workholding bucks. As the line moves from one station to another, the operator is enabled to turn the work into the position most convenient for his particular function.

Fenders are received from an outside plant and require the addition of certain brackets and reinforcements before polishing. This is done by welding with portable resistance welding guns on the merry-go-round line.

Wheel Mounting

Wheel mounting is always interesting because of the diversity of methods employed in different plants. Latest development here is the installation of two big turntables, each one containing 14 work stations, accommodating both front and rear wheel assemblies. First station is fitted with the anti-friction wheel bearings which are mounted on the spindle. Then follows the hub and drum and wheel installation. The hub is pressed over the bearings and bearings are automatically filled with a measured quantity of grease. After the fastenings have been made up, the tire is rolled in place, and as the table continues its rotation the tire is inflated to a standard pressure on a later station.

An unusual wrinkle is the mechanism

for automatically ejecting the assembly when it reaches the final station. At this point a hinged pantograph-like mechanism raises slowly, lifts the wheel off the fixture and drops it onto a short section of inclined gravity roller conveyor. This carries the wheel assembly to operators who hang it on the wheel delivery conveyor mentioned earlier.

Cast Iron Machining and Engine Details

Arrangement of the cast iron building can be readily visualized from the floor plan. Here they have isolated the machining of the cylinder block, manifolds, cylinder heads, flywheels, clutch housings, bearing caps, and valve stem guides. Since most of the cast iron machining is done dry and using cemented-carbide tools, it was felt most desirable to house these operations away from the main plant and from the paint shop in particular.

Attention is drawn particularly to the cylinder block line which is now arranged in a straight line. Outstanding feature in this department is the introduction of an unusually long, heavy duty, chip conveyor in the floor. It is of apron type and runs 800 ft in length, extending out into the yard

(Turn to page 84, please)



BRONZE BEARINGS

BUSHINGS

PRECISION BRONZE BARS

Sleeve bearings have a rugged simplicity. Bunting Cast Bronze Sleeve Bearings are designed for precision operation without delicate complexity in their construction. Bunting engineers are ready to assist in designing for their use. The Bunting Brass & Bronze Company, Toledo 9, Ohio.

Bunting

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where chips are picked up by an elevator and eventually dumped into gondola cars. Under conditions of full operation this conveyor will carry 140 tons of chips per day.

Machining of crankshafts, pistons, connecting rods, camshafts, and other parts of steel or non-ferrous metals is done within the main plant in the areas shown on the floor plan. Said to be perhaps the first installation of its kind in the industry—at least at the time this article was prepared—is a newly developed "Flotation" filtering system serving as a central grinding compound filtering unit for grinders in the crank-

shaft department.

Grinding compound from a battery of some 70 machines is constantly circulated through this unit, flowing through trenches from each machine. Within the flotation filter, the fluid—carrying sludge and dirt and metallic particles—is constantly agitated and aerated. Sludge and dirt and light metallic particles are enveloped by the frothy material which is constantly carried to the top of the tank, the froth in turn being skimmed off the top by means of paddles. This material is skimmed from the filter and removed, while the clean compound is returned

to the system for circulation through the grinders.

Coming to the engine assembly line, we find that outside accessories such as spark plugs, carburetor, electrical equipment, etc., are omitted on the line and left for later installation. This is done to permit a clean job of spraying the engine without getting paint on these accessories.

At the end of the line, engines are hooked onto a monorail for transport through the paint spray booth. Most accessories are assembled to the engine after it has passed through the spray booth and while still suspended from the overhead conveyor. They are then transferred to the floor conveyor which is a part of the engine distribution conveyor line. This threads through the block test department, permitting the operators to take engines off the line for installation on the block test. Later the conveyor transports engines from block test to motor storage whence they are scheduled for shipment to outside plants or delivery to the final line.

Block testing represents another of the new developments at Plymouth. Discarding the conventional procedure of testing motors on individual blocks with their multiplicity of service connections, Plymouth has developed a series of long stands or benches, fitted with cradles for holding engines. They have eight such benches and can test 256 engines at a time.

Each of the benches is self-contained and provided with a simple system of service lines for natural gas (used as fuel on the block test), for water in and out, and for crankcase lubricants which is constantly circulated through a central filtering and clarifying unit.

Using the same technique as for the automatic body drop, arrangements have been made for an automatic engine drop, as illustrated. It may be noted at this point that engines on the assembly line are fitted with a bracket to accommodate the hook on the engine conveyor. This bracket remains in place until the engine has been finally installed in the chassis. Then it is removed and returned to the assembly point.

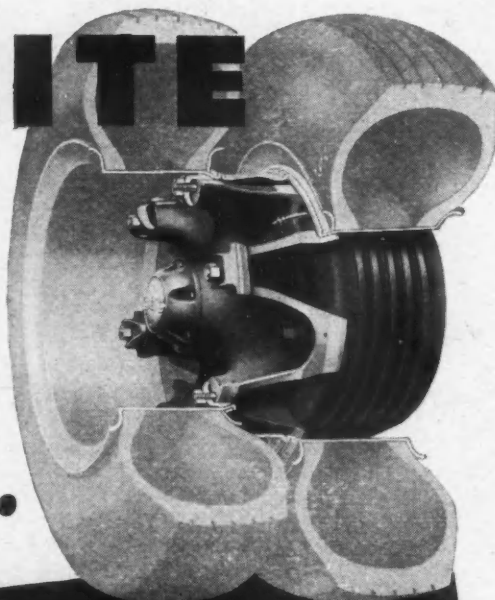
Tested engines scheduled for the final assembly line are delivered on the monorail and at the engine installation point the monorail dips to the proper level. Timing of the engine drop—as in the case of the body drop—is controlled by an operator through a control panel. This assures proper synchronization of movement of the assembly conveyor and monorail. However, the actual dropping and release of the engine are entirely automatic. Here again they have a system of guide rails, permitting the conveyor hook to disengage automatically.

So many of the production ideas described above seemed to be unique that we wish to express our appreciation of the cooperation of the Plymouth management in making the details available to readers of this publication.

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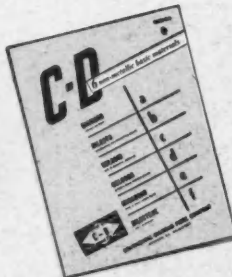
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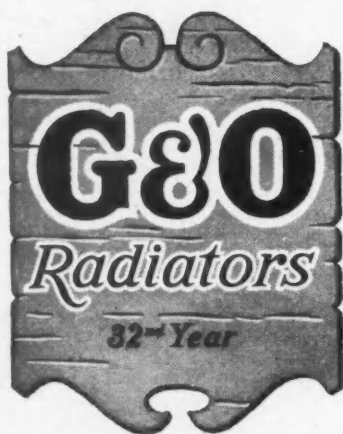
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Packard Marine Engine

(Continued from page 49)

Electrical equipment for both engines includes 6-volt battery ignition with distributor and coil, belt driven generator, voltage and current regulation, and starting motor with Bendix type starting gear. Spark plugs are of 10 mm size, the same as used in Packard motor car engines for almost 10 years. All electrical equipment is given a marine corrosion resistant treatment. An optional 12-volt system can be supplied.

Engines are available in both right- and left-hand rotation for twin engine installations. Mountings are of shear type rubber with four mounting arms on the Six. The Eight is provided with four mountings for direct drive and for use with the 1.45 to 1 reduction gear; with six arms for 2.52 to 1 reduction.

The Model 1M-356, 8-cylinder marine engine is L-head, 3½ in. bore x 4½ in. stroke, 356 cu in. displacement and rated 150 hp at 3200 rpm with compression ratio of 7 to 1. It is fitted with a nine-bearing, counterweighted crankshaft, torsional vibration dampener and rear mounted flywheel. Major constructional difference between the two engines is the use on the Eight of Wilcox-Rich zero-lash, hydraulic valve lifters.

Another difference is found in manifolding. On the Eight the intake manifold is of dual type, has heated riser and is separate from the exhaust manifold. The latter is jacketed for water cooling and arranged for exhaust pipe attachment at either end.

A 2-in. Zenith up-draft carburetor with flame arrestor is standard on the Eight. Piston ring set-up on both engines is the same as on Packard passenger car engines—three Perfect Circle rings with Type 86 oil control ring featuring the exclusive internal coil spring expander first used by Packard in recent years.

The Packard reverse gear is of unique design offering many advantages, the most important being the finger tip control of direct, neutral, and reverse maneuvers. It presents a self-contained hydraulic pressure system with a shaft-driven built-in oil pump which circulates the lubricant through the gear system and through a separate externally mounted oil cooler. It is independent of the engine lube system in every respect.

Functioning of the hydraulic system is controlled through a manually operated hydraulic valve having the three positions—forward, neutral, and reverse—which are selected simply by moving a small lever mounted on the outside of the case. Forward speed is effected through a multiple disc clutch operated by a horizontal cylinder within the case. Functioning of the bevel gear, one to one ratio reverse is controlled by a band brake operated by means of a vertical cylinder whose outer end is housed in the projection at the top of the case.

Deliveries of the two engines are scheduled to begin in April.

A NEW FREE SERVICE...



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- Aluminum Production... p. 1
(A brief resumé of the Bayer and Hall processes)
- Questions and Answers... p. 2
 - Mink Waterer
 - Soldering Aluminum
 - “Colors” in Alloys
 - Sofa Bed Frames
 - Portable Kitchens
 - Buckets
 - Newspaper Tubes
- Welding Aluminum... p. 3, 4
(First section of Reynolds process manual, appearing here serially)

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New Automobile Barge

(Continued from page 27)

long tons of freight. Fully loaded, each unit displaces 2483.5 tons of fresh water to a 5½ ft draft. Beam at the water line measures 35 ft, and on deck, 45 ft.

Propulsion power is supplied by three General Motors Diesel Quad multiple

engine units, each of which is rated at 660 bhp at 1850 rpm. A Quad unit consists of four basic six-cylinder engines mounted together and driving a single propeller shaft through a 4.4 to 1 reduction gear. Correct engine water temperature is maintained through

separate closed cooling systems for individual Quads, each system having its own shell and tube heat exchanger. Basic engines have individual clutch and throttle controls so that under light load conditions one or more engines in a unit may be shut off for more economical operation. If necessary, basic engines can be disconnected quickly and replaced either enroute or at port during loading, thus obviating costly lay up time while repair work is being performed. Hatches directly over the engine room facilitate quick removal or exchange of any engine. Each of the three units measures 4½ ft by 10½ ft and 4½ ft high. Each of the three 60 in. controllable pitch propellers is driven at 415 rpm by a separate Quad engine unit. Since there are no reverse gears, backing is accomplished by simply reversing the propeller pitch by means of a hydraulic mechanism. Engines need not be throttled down when this operation is performed. The controllable pitch feature, in addition to providing the ultimate in maneuverability, allows the engines to operate at maximum efficiency at different loads and river depths.

Immediately forward of the engine room is a 35 by 20 ft compartment containing electrical apparatus. Two GM 30 kw generator sets operate continually while a third functions as a standby plant for emergency use. Instruments including shaft tachometers, engine oil-pressure gages, low oil-pressure alarms and water temperature alarms are located here at the engineer's control station. Propeller controls, throttles and shaft tachometers are duplicated in the pilot house. Fuel bunkers located in the bow section of the power unit have sufficient capacity to allow a full load cruising radius of 2300 miles.

Each vessel is steered by two double plate streamlined rudders operated in unison by a single electro-hydraulic ram. Other devices that have been installed include an intercommunicating telephone system, an RCA 75 watt radiotelephone, and Bell radio telephone.

Vehicles are loaded from floating deck barges that are equipped with ramps, so placed as to enable simultaneous loading of all four decks. Six hundred automobiles can be placed on board in about four hr. This is in contrast to old crane loading methods which take up to 24 hr to load the same number of cars.

New Tax System

(Continued from page 54)

If, officially, factories have opened up, there is so little co-ordinated production that it is doubtful if the industry averages more than three working days a week. The sheet steel shortage is still acute and components are being received so erratically that it is difficult to fix any production program.



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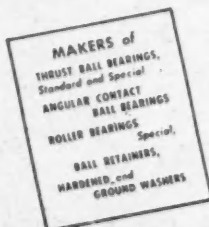
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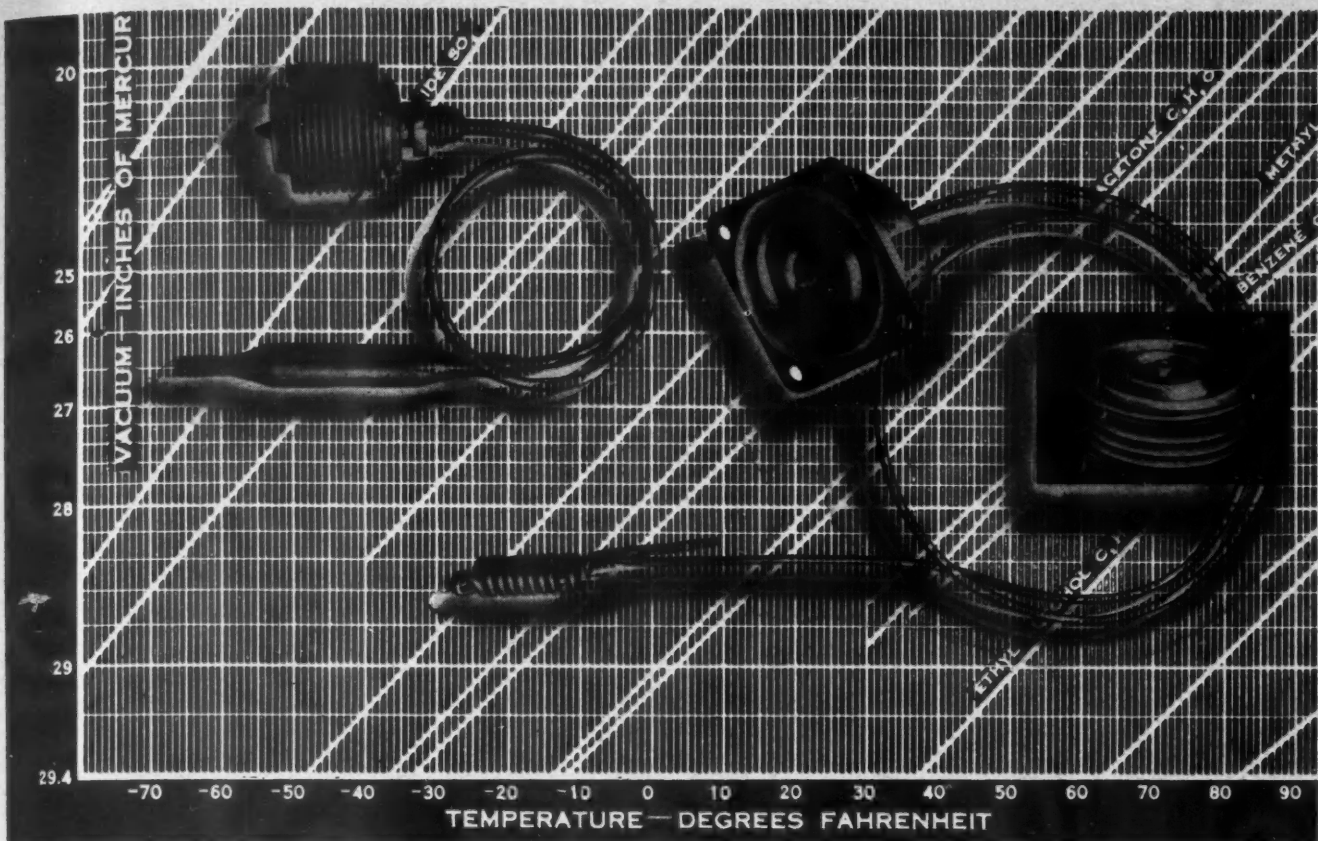
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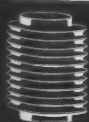
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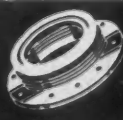
Instrument Bellows



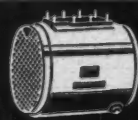
Aircraft Bellows Assembly



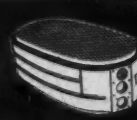
Steam Trap Bellows Assembly



Bellows Seal Assembly



All-Aluminum Cylindrical Oil Cooler



All-Aluminum Oval Oil Cooler

GENERAL

(Continued from page 23)

Two New Foundries For General Motors

General Motors Corp. has announced that it will build a new malleable iron foundry in Danville, Ill., and a new grey iron foundry in Defiance, Ohio. Both of these new foundries will be operated by GM's Central Foundry Div. which now operates foundries in Lockport, N. Y., Saginaw, Mich., and Danville, Ill.

The new Danville plant will have approximately the same floor space as the present plant and will be operated in conjunction with it. The Defiance plant will be built on a tract of 265 acres acquired by GM last fall.

Actual construction work on both plants will begin as soon as materials are available and it is expected that ground will be broken by early spring and that the plant at Danville will be ready to operate before the end of the year. The new facilities at Danville will provide employment for approximately 600 people in addition to the 1200 who will be employed in the present grey iron foundry.

GE Builds Big Gas Turbines

Two developmental gas turbines, one a 5000 kw machine for electric power stations, and the other a 4800 hp unit are being constructed by the General Electric Co. Shop tests of the 4800 hp turbine are scheduled to begin this spring. The stationary power plant is in the design stage and will not undergo factory test until 1948.

Development of these large gas turbines began before the war but was sidetracked to permit concentration of General Electric facilities in the field of aircraft power plants. After the close of the war, continued development of the TG-100, TG-180 and other aircraft gas turbines was transferred to the GE Lynn, Mass. Works, and development of gas turbines for stationary, marine and other applications was begun again at Schenectady.

More Space for SKF Roller Bearing Output

SKF Industries, Inc. is lining up factories at Hornell, N. Y. for the production of cast iron pillow blocks and at Shippensburg, Pa. for retainers for bearings now being made in Philadelphia. The move which will be made about July 1 will provide more space for spherical roller bearing production in Philadelphia, and it is anticipated that output will be increased by 50 per cent within a year.

British Ease Up a Bit On Automotive Imports

Among the 34 commodity groups added recently to the list of products which may be imported into the United Kingdom under the British Token Import Plan are the following: automotive cables, windshield wipers and parts, and chemical maintenance products for motor cars except oils and polishes.

New Wright Engine For Airlines

Wright Aeronautical Corp. is producing in quantity a new airplane engine, the Cyclone 18BD, the first to be engineered and produced exclusively for the airlines since the war. The new engine, certified at 2500 hp, powers the newest Constellation models.

Borg-Warner to Handle Autopulse Exports

The export business of Autopulse Corp., Detroit, manufacturer of electric fuel pumps, will be handled by Borg-Warner International Corp., Chicago.

(Turn to page 92, please)

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All fleet owners are trying to reduce their operating costs.

All are potential prospects for an engine fan control that can save up to 10% of fuel consumed.

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All-Nylon Tires Announced By Two Manufacturers

Two new premium passenger car tires constructed of all-nylon cord have been recently announced by the Firestone Tire and Rubber Co. and the Goodyear Tire and Rubber Co. Firestone's tire, the Imperial, features a nylon tread ply which gives more wear than previous premium line casings it is claimed in addition to silent running and automatic pebble ejection. The Goodyear all-nylon

cord tire, identified as the Double Eagle, is claimed to have 60 per cent more strength than the best cord previously used. Only the larger car sizes are available at present because of limited production schedules.

Borg-Warner Gets Plant

The Franklin, Pa., steel works of the Chicago Railway Equipment Co. will be acquired by the Borg-Warner Corp. on May 1 under the terms of a recently announced sales agreement.



Many forging designs in steel, aluminum and magnesium have been originated by Wyman-Gordon. Typical of the many intricate forgings is this four-way spider. . . . Every Wyman-Gordon forging is under strict, constant control by laboratories that through the years have contributed much to investigation and research of new forging techniques and of new alloys of steel and the non-ferrous light metals.

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Business in Brief

*Written by the Guaranty Trust Co.,
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MOTIVE and AVIATION INDUSTRIES*

Narrow fluctuations in general business activity are indicated. The *New York Times* index for the week ended March 8 stands at 144.2, as against 147.5 for the preceding week and 127.9 a year ago.

Sales of department stores during the week ended March 8, as reported by the Federal Reserve Board, equaled 254 per cent of the 1935-39 average, as compared with 238 per cent in the week before. Sales were 9 per cent above the corresponding distribution a year earlier, as against a preceding similar excess of 10 per cent. The total in 1947 so far reported is 13 per cent greater than the comparable sum in 1946.

Electric power production increased slightly in the week ended March 8. The output was 21.1 per cent above the corresponding amount in 1946, as compared with a like advance of 19.9 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 805,789 cars, 5.2 per cent less than the figure for the week before but 2.5 per cent above the corresponding number in the preceding year.

Crude oil production in the week ended March 8 averaged 4,823,900 barrels daily, 52,550 barrels more than the preceding average and 420,550 barrels above the comparable output in 1946.

Production of bituminous coal and lignite during the week ended March 8 is estimated at 12,780,000 net tons, 120,000 tons above the output in the week before. The total production in 1947 so far reported is 1.8 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended March 13, according to *Engineering News-Record*, is \$103,332,000, or 19 per cent below the preceding weekly figure but 38 per cent above the comparable sum in 1946. The total recorded for eleven weeks of this year is 38 per cent more than the corresponding amount in 1946. The increase in private construction is 36 per cent, and the rise in public construction is 42 per cent.

The wholesale price index of the Bureau of Labor statistics for the week ended March 8 is 148.7 per cent of the 1926 average, as compared with 146.4 for the preceding week and 108.2 a year earlier.

Member bank reserve balances decreased \$83 million during the week ended March 12. Underlying changes thus reflected include a decline of \$24 million in Reserve Bank credit and a rise of \$22 million in Treasury deposits with Federal Reserve banks, accompanied by a reduction of \$5 million in money in circulation.

Total loans and investments of reporting member banks advanced \$361 million during the week ended March 5. An increase of \$90 million in commercial, industrial and agricultural loans was recorded. The sum of these business loans, \$10,802 million, shows a net increase of \$3,344 million in 12 months.